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of the

Department of Agriculture in the Bombay Presidency

For the Year 1933-34

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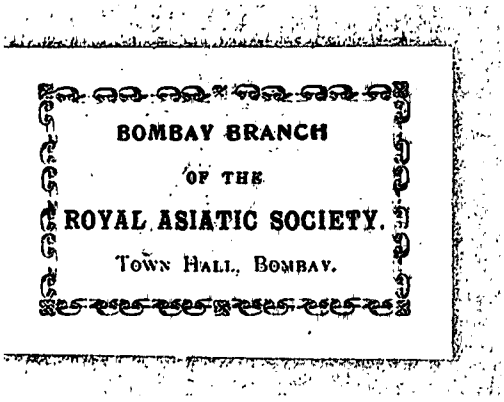

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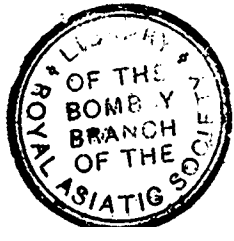

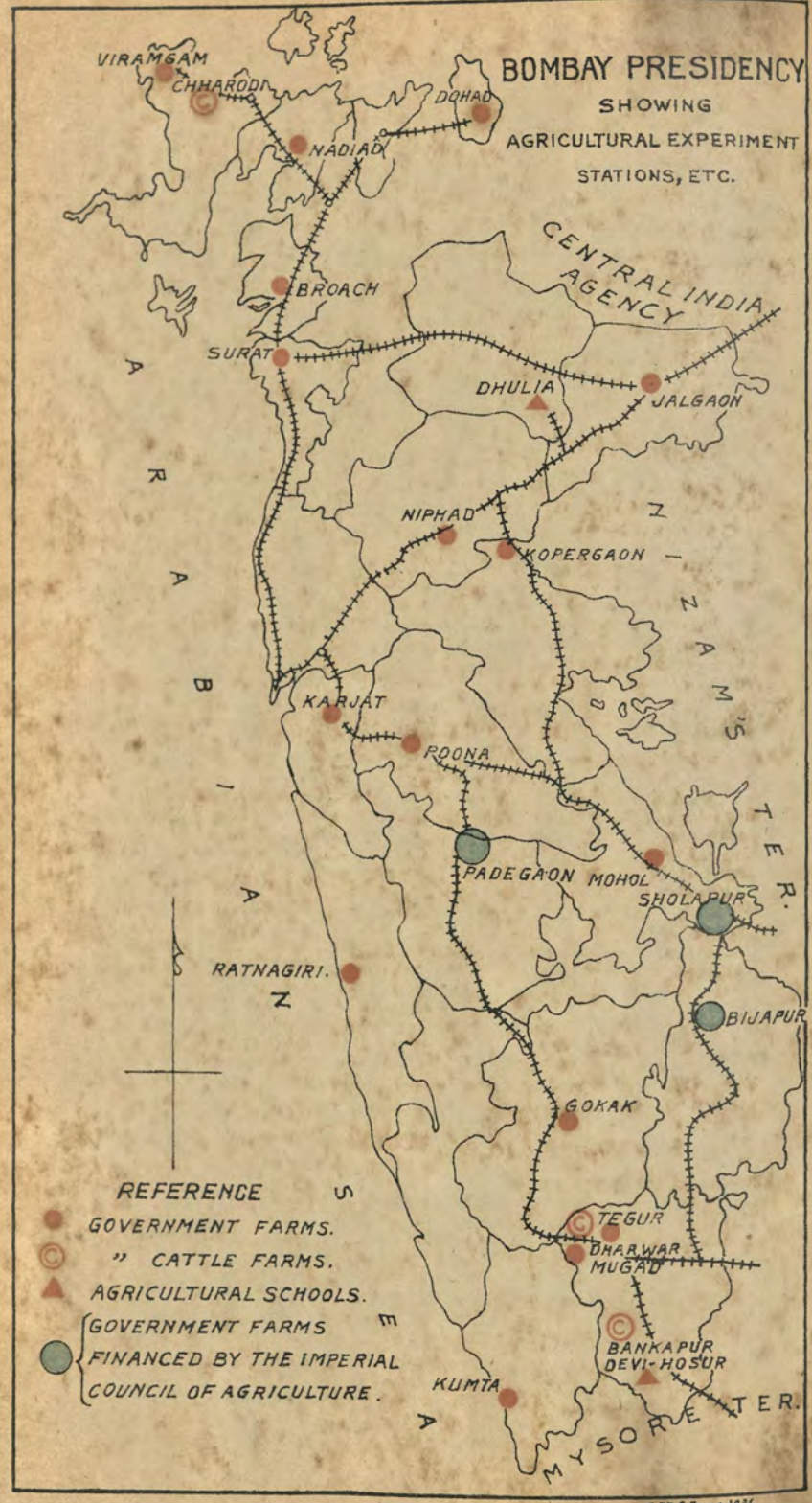

G.P.P. Poona, 1934.

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1933-34.

CHAPTER I.

FEATURES OF THE YEAR.

CLIMATE AND OUTTURN.

The year under report was, on the whole, fair, although less satisfactory than its predecessor. Three successive cold waves occurred in the northern part of the Presidency during January 1934 and caused considerable damage to rabi crops. The cotton crop likewise suffered to a great extent, while a large portion of the grape crop in the Nasik District and of the fruit and vegetable crops in the North Deccan were damaged. Sugarcane on the Deccan Canals in the Poona and Ahmednagar Districts did not suffer, but sugarcane in the Khandesh and Nasik Districts was badly hit. The wheat crop in the Deccan and the Karnatak was affected by rust. Hence, although the area under the plough was a little larger than last year, the resulting outturns did not come up to expectation and, in the case of the Deccan, were below that of the last year. The following tabular statement compares the actual acreage sown and the estimated tonnage of the food grain crops produced in the years 1932-33 and 1933-34 : —

Divisions.	Area in thousands of acres.		Estimated outturns in thousands of tons.	
	1932-33.	1933-34.	1932-33.	1933-34.
	Acres.	Acres.	Tons.	Tons.
Gujarat	2,342	2,550	704	754
Deccan	11,052	11,104	2,077	1,904
Karnatak	4,702	4,542	955	928
Konkan	1,606	1,604	651	628
Total, Bombay Presidency ..	19,702	19,800	4,387	4,214

The following statement shows that, taking all crops together, there has been little alteration in the total area sown during the last four years. Groundnut, however, shows an increase, which reached the record figure of 1,292,000 acres in the year under report. : —

Year.	Area in thousands of acres sown with different crops in the Bombay Presidency proper.			
	Food-grain crops (cereals and pulses).	Cotton.	Ground-nut.	All crops.
	Acres.	Acres.	Acres.	Acres.
1930–31	20,502	3,550	999	29,133
1931–32	20,059	4,065	989	29,372
1932–33	19,702	3,879	1,195	29,155
1933–34	19,792	3,655	1,292	29,181

The decline noticed in the cotton area as compared with last year was due to excessive rains at the time of sowing in Gujarat and deficient rains at sowing time in the Karnatak.

The prices of wheat and groundnuts showed a downward tendency, which was specially marked in the case of groundnuts. A satisfactory feature was, however, the slight upward trend in cotton prices.

Prices prevailing at harvest time for agricultural produce in seers of 80 tolas per rupee except of cotton which are recorded in rupees per khandi of 784 lbs.

Year.	Food crops.			Export crops.		
	Jowar (Sholapur)	Bajri (Nasik).	Rice (Thana).	Wheat (Ahmedabad).	Broach Cotton (Bombay).	Groundnut (Karad).
	Seers.	Seers.	Seers.	Seers.	Rs.	Seers.
1929–30 ..	10	7	6	7	257	8
1930–31 ..	22	9	8	12	197	17
1931–32 ..	23	16	9	12	194	15
1932–33 ..	21	12	9	9	199	10
1933–34 ..	20	12	9	11	207	17

The actual fluctuations in cotton prices will be seen from the following statement which gives the prices in rupees per khandi (784 lbs.) of Broach F. G. cotton at Bombay during the year under report :—

Month—1933.	Prices in Rupees	Month—1934.	Prices in Rupees
August	210	January	201
September	199	February	214
October	191	March	206
November	184	April	201
December	181	May	198
		June	214
		July	217

Sugar Development.

In last year's report, an account was given of the six new sugar factories in the Bombay Presidency. There have been no additions to the number of factories since then. Development in the case of each of these factories has gone on and with the exception of the Saswad Mali factory all have been producing sugar this year. The amounts of cane grown, cane purchased and sugar produced in the case of each factory are believed to be as follows :—

Name of Factory.	Amount of cane grown.	Amount of cane purchased.	Amount of sugar produced.
	Acres.	Tons.	Tons.
1. The Saswad Mali Sugar Factory, Akluj.	900	*Nil.*	Did not produce sugar during the year under report.
2. The Phaltan Sugar Factory at Pimpalwadi.	550	10,000	5,000
3. Messrs. Marsland Price and Co., Kalam, District Poona.	900	8,000	Over 2,000
4. The Maharashtra Sugar Mills Ltd. at Kandala, District Ahmednagar.	500	15,000	2,000
5. The Rawalgaon Sugar Factory ..	800	2,000	2,200
6. The Kolhapur Sugar Mills Ltd., Kolhapur.	600	50,000	5,000
7. The Belapur Sugar Factory ..	2,700	7,000	Over 10,000

During the year, the Central Legislature passed the following important Bills affecting the sugar-cane industry :—

(1) India Act No. XIV of 1934.—An Act to provide for the imposition and collection of an excise duty on sugar.

(2) India Act No. XV of 1934.—An Act to regulate the price of sugarcane intended for use in sugar factories.

In connection with the Bill regarding the Sugar Excise, an important question has arisen. Under the Act, only factories which employ 20 or more workers are liable to the excise duty. It is a matter of some importance to owners of open-pan installations as to how this number is to be calculated, i.e. exactly what employees are to be counted. The only persons not considered as being employed on such installations are those outside the factory premises or precincts employed in cutting and transporting the cane to the factory. The " Khandsari " (open-pan) industry, as it is at least a temporary relief to the hard-pressed cane-growers of the Deccan Canal, especially such as are not in a position to sell their cane at a profitable price to big factories. In last year's report (page 4) it was stated that as a result of the Co-operative Conference held in Poona on June 2 and 3, 1933, Government would put up an installation for manufacturing sugar by the open-pan process at Hol on the Nira Right Bank Canal. The first year's working of this plant is being fully reported in a bulletin. The net result is that by making first sugar and gul from molasses, a profit of Rs. 157 per acre has been obtained as against a profit of only Rs. 30 if merely gul had been manufactured. The price of gul in the Deccan showed a sudden upward rise about 40 to 50 per cent. The cultivator, however, did not profit by this, as at this time the whole of the gul had been sold by the culivator to the merchants and it was they who reaped the benefit. It has been so many years, however, since there has been a marked upward movement in gul prices that this particular upward fluctuation is very welcome.

Attempts to restrict world overproduction of sugar and thereby to increase sugar prices have not been very successful. The most recent effort in this direction (the results of which have yet to be observed) is the Jones-Costigan bill which President Roosevelt approved on May 9, 1934. This has to do with the reduction of sugar in America itself, and certain adjacent countries. There is now in India a movement among

sugar producers to prevent price deterioration. Sugar prices in Bombay fluctuated as in the table given below :—

Statement showing prices of sugar (Indian and Java) from August 1933 to July 1934.

Month.	Price of sugar at Bombay per cwt.	
	Indian.	Java.
	Rs. a. p.	Rs. a. p.
August 1933	13 8 6	14 10 10
September „	13 8 2	14 11 0
October „	13 6 2	14 11 8
November „	12 13 10	14 12 8
December „	12 10 2	14 1 3
January 1934	11 10 7	13 12 1
February „	11 15 3	14 2 10
March „	12 4 3	14 4 9
April „	12 9 11	14 2 4
May „	13 0 7	14 0 0
June „	12 14 2	13 14 10
July „	12 13 10	13 15 2

The second of the Acts above mentioned offers a means whereby Local Governments can, if they so desire, ensure that a minimum price shall be paid by factories to the cultivator for the cane he produces. The Government of Bombay arranged for the holding of a Conference of Officers of the Revenue and Agricultural Departments and other interested parties to discuss the question.

Marketing.

This important subject was dealt with by the Provincial Economic Conference. In the report of that conference, the Government of India undertook to find the money for a central marketing organization and for provincial marketing organizations. If these can be brought into being quickly, it will be the biggest step forward in economic development that has hitherto been taken in India. A Marketing Expert, Mr. A. M. Livingstone, has been added to the headquarters staff of the Imperial Council of Agricultural Research and he has already begun the study of Indian problems and the organization of the headquarters section of the marketing scheme. Plans for the provincial organisation to be established in the Bombay Presidency have already been prepared and only await the allotment of money by the Central Government for putting them into action.

The Government of Bombay appointed, by Government Resolution, No. 8784/28, dated 28th June 1933, Revenue Department, a committee to examine the question of fruit marketing in Bombay with the following terms of reference :—

(1) to investigate and report on the conditions under which fruits and vegetables are marketed at present in the municipal and private markets of the town of Bombay and to make recommendations for the improvement of these conditions in order to increase the supply of reasonably priced fruits and vegetables in Bombay and its suburbs and give a better return to the grower;

(2) to consider the feasibility of establishing a small experimental market in Bombay for the introduction and testing of improved methods of marketing fruits and vegetables;

(3) to consider the feasibility of bringing all the existing municipal and private fruit and vegetable markets in Bombay under one control and one set of improved regulations.

This committee has taken a good deal of time for its deliberations and has just produced (July 1934) a lengthy report which it will take some time to digest and concerning whose recommendations, decisions will have to be later taken.

An admirable study of the marketing of fruit in Poona was published during the year by Messrs. D. R. Gadgil and V. R. Gadgil, as a publication of the Gokhale Institute of Politics and Economics (Publication No. 3).

The railway authorities have been evincing a great deal of interest in the forthcoming marketing organization and will offer cordial collaboration in its working.

The one regulated cotton market at Dhulia in the Bombay Presidency has continued to work with success during the year. The success is particularly shown by the increased number of carts dealt with, the reduction of fees for the work done and the diminishing number of disputes which it was necessary to settle. Arrangements for a similar market at the neighbouring town of Amalner are very nearly complete. It is hoped shortly to take up the question of a similar market in the Southern Division.

Reference was made last year to the exportation of mangoes for sale in England. For the time being this is being discouraged and attention is being concentrated on solving,

in the cold storage research station at Ganeshkhind, the fundamental problems of (1) the best varieties, (2) the best stage of ripeness, and (3) the best temperature at which preservation can be carried out. The interest in overseas export of fruit continues throughout all the provinces in India and there is an admirable opportunity for a centralized exporting agency as soon as the necessary data are available and satisfactory arrangements made with the shipping companies.

Visitors and Conferences.

The year was one of much healthy coming and going and fruitful discussion. Dr. P. S. Hudson, Deputy Director of the Imperial Bureau of Plant Genetics, Cambridge, made a tour in India. He established valuable contacts with workers in plant breeding, gave a great deal of help and advice and was particularly useful as a visitor at the Advisory Board of the Imperial Council of Agricultural Research. Sir Richard Jackson, Chairman of the Indian Cotton Enquiry Committee and of the Empire Cotton Growing Corporation, travelled throughout India in order to help on arrangements whereby Lancashire will take more Indian cotton. In order to advise Government on the question of an economic census, Professor A. L. Bowley and Mr. D. H. Robertson visited India and their report has just been published. It is likely that this will have a very beneficial effect on all future planning for the improvement of statistics in India. Miss Caton, Secretary of the Indian Village Welfare Association (England), also visited India. All these visitors spent some time in the Bombay Presidency and met workers (both official and non-official) in their particular subjects.

During the year under report, the Indian cotton trade was still gravely perturbed over the threatened Japanese boycott of Indian cotton. This difficult problem was solved by negotiation, an important Japanese delegation having been sent to India for the purpose. The Khandesh cotton tract of the Bombay Presidency is one of the areas benefited by this arrangement.

Before retiring from office, His Excellency the Governor Sir Frederick Sykes held three important Darbars, one in each Division, at which he spoke at length on the question of village uplift. Successful agricultural demonstrations were organized in connection with each of these Darbars.

The Indian Science Congress was to have been held in Poona, but due to the presence of plague at that time it had to be

shifted to Bombay. The presence of this congress is a great stimulus to the scientific life of the Presidency in which it is held. Many of the officers of the Bombay Agricultural Department attended the congress, read papers and took part in the discussions.

An important Sugar Conference was held at Simla on the 10th, 11th and 12th July 1933 at which the Bombay Presidency was strongly represented. Decisions of far reaching character were taken at this meeting.

Probably the most important conference of all was the Provincial Economic Conference which met under the presidency of Sir George Schuster in Delhi from 3rd to 6th April 1934. The Bombay Presidency was again strongly represented. Following on this was a special conference regarding the price of wheat held in Simla on 10th of May 1934 which had very little result, as the members came to the conclusion that the matter was mainly a problem for the Punjab. The Crop Planning Conference held in Simla on 8th and 9th June 1934 was, however, a really important meeting. The Advisory Board of the Imperial Council of Agricultural Research spent three days in digesting the mass of material provided and in coming to tentative conclusions. These were then discussed in the full Crop Planning Conference, on two successive days, under the presidency of The Honourable Sir Fazl-i-Husain, Member in charge of the Department of Education, Health and Lands of the Government of India.

The Crop Planning Conference undoubtedly did much good in assembling data and clearing ground. Its work should be followed up.

In the last Annual Report, page 3, reference was made to the failure of the World Economic Conference, 1933. The following extracts from an article by Sir George Peish on "Recovery Now" in the *Review* of *Reviews* for June 1934, page 63, is worth quoting in full:—

> "But if the whole world is not to be subjected to the risk of a depression far greater than so far experienced, the World Economic Conference must be called together again to decide upon, and to apply the true remedies. The hopes of the world have been raised by the signs of greater understanding on the part of the statesmen. It will be well to prevent these hopes from giving way to renewed despair.
>
> In the meantime, it is most desirable that the thoughts of the statesmen should continue to concentrate upon the

questions of expanding consumption, not only locally, but universally. The question that really needs to be answered is how can consumption be permanently increased and not merely how can things be sold at higher prices.

Such a situation as this can only be corrected by a great increase in consumption, and a recovery in prices in consequence of this expansion; certainly not by measures to curtail production and to force prices higher by artificial means."

CHAPTER II.

AGRICULTURAL SERVICE AND PROPAGANDA.

In the year under report there have been no additions to the strength of the Agricultural Department on the propaganda side, but the work has been carried out with vigour and enthusiasm in all directions. The various newly started bodies in connection with village uplift have offered opportunities for agricultural propaganda, particularly in connection with the Agricultural Sub-Committees and it is hoped to develop further the opportunities so offered. Amongst non-official organisations, such have been specially active in doing village uplift work, may be mentioned the Deccan Agricultural Association which has established a special rural uplift sub-committee for this work. The work is centred at Khed-Shivapur. The Village Improvement Committee, Sholapur, has similarly done a great deal of work centered at Mulegaon. It is particularly desirable that village uplift organizations should make the fullest use of the authoritative technical advice available from the Agricultural Department so as to be sure that they are on the right lines in the things they advocate and in the methods they use.

Publicity.

The Agricultural Department has by every possible means "to get across" its results to the cultivating public. The means used up to date have been shows, plots in cultivators' fields, demonstrations, magic lantern demonstrations, training classes and leaflets. We are beginning, particularly under the stimulus of the Indian Central Cotton Committee, to use posters a little more, but there are still untouched means of propaganda.

The Director of Agriculture in the course of a visit to the Vadala Mission near Ahmednagar was greatly struck by the utilization of marionettes for propaganda purposes there. These marionettes had been made by the children of the school and were operated by the children. In this case the object of the propaganda was public health and little plays were given dealing with such things as malaria and its treatment. The application of the method to all types of propaganda is obvious.

During the year the Department organized or took a major share in organizing 22 Shows and literally hundreds of demonstrations, most of the latter being on cultivators' fields.

The old gibe that a method or crop might be all right on a Government farm but would probably be no use on a cultivator's field can no longer be used. In most places we can now demonstrate a whole body of improved practice, made up of many different items, each the result of scientific investigation. This is specially so in irrigation farming, where the pioneer work of the Agricultural Department, followed up in recent years by increasingly effective experiment and intensive propaganda, has made a big difference for the better.

Distribution of Seeds of Improved Crops.

One of the crying needs of the Department is an arrangement for the rapid multiplication and distribution on a large scale of seeds of improved crop varieties evolved or introduced by the Department. The only crop on which this is being done on a big scale is cotton, and the cotton seed distribution schemes have been in most cases generously financed by the Indian Central Cotton Committee. We need schemes equally large and comprehensive for improved varieties of jowar, bajri, wheat, rice, castor, tobacco, sann hemp, and other crops. The cost of such schemes can be largely reduced by enlisting the help of public spirited landowners who will undertake to grow these improved varieties and, in actual fact, we do even now make use of the help of such people at present. The method, however, needs to be applied on a much bigger and more organized scale, and there is a certain inevitable amount of expenditure involved in such items as "roguing" (i.e. removing plants not true to type), special harvesting, threshing and storing of the improved seed, transport of the seed to selected distribution centres and hire of premises for distribution centres. The opportunities in such a programme are enormous and the results certain.

Until money is provided for really big seed distribution schemes, the work of spreading good seed must be on a smaller scale. This work is described in the paragraphs below.

Rice Seed Distribution.—In North Thana, 1,570 lbs. of seed of K226 strain were distributed among 19 seed-growers. In addition to this, the seed-growers and landlords carry on the work on their own accord from their preserved stock, and it is estimated that they distributed about 16,240 lbs. of seed. 835 lbs. of strain No. 184 were also distributed to seed-growers, and it is estimated that about 11,950 lbs. of seed were further distributed by seed-growers and landlords from their stock.

In South Thana, 2,990 lbs. of seed of K42 strain were distributed to 15 growers, and it is estimated that an area of

about 4,000 acres was under this strain in South Thana. 1,020 lbs. of K226 strain were also given out in South Thana.

In the Kolaba District, 9,787 lbs. of seed of K42 and 874 lbs. of K226 were distributed. In addition to this, 1,092 lbs. of seed of strain No. 184 were also distributed to seed-growers.

In the Ratnagiri District, in all 6,900 lbs. of Panwel No. 61 and Kolamba Nos. 184, 401 and 42 were distributed to the seed-growers for an area of 150 acres. The heavy rains of September 1933 spoiled the crop, and only 60,000 lbs. of good seed were made available for distribution to the general public which was sufficient for 1,200 acres.

Nagli Seed Distribution.—2,800 lbs. of the improved strains were supplied to the registered seed-growers for an area of 300 acres. 7,000 lbs. of seed were available for distribution which would be sufficient for about 1,000 acres.

Wheat Seed Distribution.—The seed of strain No. 224 was multiplied on the Jalgaon Farm and there is a stock of 16,000 lbs. available for distribution.

Arrangements to multiply the seed of strain No. 168 were also made on the Jalgaon Farm and a quantity of 22,000 lbs. is held in stock there.

During the year under report, 12,970 lbs. of the seed of wheat No. 808 were distributed in the Niphad, Nasik and Sinnar talukas covering an area of about 216 acres. Wheat No.808 was grown on the Jalgaon Farm for seed multiplication, and 6,000 lbs. of pure seed are available for distribution.

Seed Supply (Cotton).

The following tables show the work done under the Hubli Jayawant Cotton seed Scheme and the Gadag Cotton seed Scheme :—

Name of variety.	Stage.	Quantity of seed distributed in 1933-34. lbs.	Area in acres.	Quantity of produce obtained in dokras. (336 lbs.)
Jayawant	II	....	....	51
	III	10,426	892	308
	IV	120,898	14,065	2,834
	V(*a*)	211,083	18,716	3,621
	V(*b*)	1,363,173	139,400	786
Total		1,705,580	173,073	7,600

V(*a*) means reserved area of V generation.
V(*b*) means general area.

Name of variety.	Stage.	Quantity of seed distributed in 1933-34. lbs.	Area in acres.	Quantity of produce obtained in dokras. (336 lbs.)
Gadag No. 1	II	....	....	25
	III	1,590	133	50
	IV	31,407	2,954	392
	V	242,462	21,531	2,835
	VI	418,763	44,800	673
Total ..	..	694,222	69,418	3,975

Name of variety.	Stage.	Approximate quantity of seed purchased for distribution in 1934-35.	Quantity of seed to be purchased.	Total quantity of seed to be stocked for 1934-35.
Jayawant	II	10,472	....	10,472
	III	86,240	....	86,240
	IV	793,520	....	793,520
	V(*a*)	1,055,000	....	1,055,000
	V(*b*)	204,960	....	204,960
Total ..	..	2,150,192	....	2,150,192
Gadag No. 1	II	6,216	....	6,216
	III	11,560	....	11,560
	IV	89,831	....	89,831
	V	643,743	....	643,743
	VI	152,840	....	152,840
Total ..	..	9,04,190	....	904,190

V(*a*) means reserved area of V generation.
V(*b*) means general area.

The proposals put up to the Indian Central Cotton Committee for the revision of the methods of financing these two schemes, as referred to in the last year's Annual Report, were negatived by the Indian Central Cotton Committee and the schemes will be continued with the old methods as originally sanctioned, till the close of their period i.e. end of May 1935. Before that date, it will be necessary to make a plan for organizing further cotton-seed distribution in the Southern Division and it is hoped to put up a new and comprehensive scheme to the

Indian Central Cotton Committee in their meeting of February 1935. Much experience has been gained in the working of these two seed schemes and it is hoped in any further scheme to be able to avoid difficulties which have arisen in the working of the old schemes.

Some cultivators of Haveri and Ranibennur Talukas of the Dharwar District are extending the cultivation of "New-cross" cotton (Dharwar No. 1 × Rosea) which is susceptible to wilt and which has shorter staple than Jayawant. This was a cross made by the Cotton Breeder, Dharwar, with a view of increasing the ginning percentage of Dharwar I, and it was tried originally at Bailhongal. That is how it got into the cultivators' hands. If the spread of this New-cross cotton is allowed, it will spoil the reputation of the Kumpta-Dharwar area for long-staple cottons. In order to prevent the spread of this New-cross cotton, the Deputy Director of Agriculture, Southern Division, has issued a leaflet for distribution in the above talukas which describes the advantages of growing long-stapled Jayawant cotton and also how the New-cross cotton is likely to spread wilt and spoil the name of the Hubli Market. Copies of this leaflet have been distributed through the Agricultural and Revenue Officers and the Taluka Development Associations. The Hubli Cotton Sale Society has also been asked to open depôts of Jayawant cotton-seed in the above two talukas. The Collector of Dharwar has warned the cultivators that the two talukas will be cut off from the Kumpta-Dharwar area if they continue to grow New-cross cotton and its import into the Hubli Cotton Market will be prohibited.

Athani Cotton-seed Scheme.—The first year of this scheme is now over and the following is a short résumé of the work done.

In the first year of the scheme a reserved area of 1,000 acres under stages III and IV in the seed multiplication scheme was formed at Kagwad. During the year under report, the reserved area was extended to about 11,100 acres as detailed below :—

Generation.	Area organized.
III	100
IV	1,000
V	10,000
	11,100 acres.

Khandesh Banilla Cotton-seed Scheme.—The third year of this scheme has now been completed and the following is a short account of the work done :—

Stage I.—Continued to be grown on the Dhulia Farm on 6¼ acres and 1,100 lbs. of selfed seed was obtained from the crop.

Stage II—Multiplication of pure seed.—An area of 103 acres on the Bhadgaon Farm was sown with selfed seed. The quantity of seed obtained was 20,000 lbs.

Stage III.—Under this stage in the Bharwas village group 37,700 lbs. of pure seed including that produced on the Bhadgaon Farm in the last year was distributed and sown on an area of 1,359 acres. This yielded 1,76,410 lbs. of purified seed.

Stage IV.—A total quantity of 3,73,253 lbs. of seed was distributed among the registered seed-growers in 100 villages in the talukas of Amalner, Shirpur, Erandol, Pachora, Chalisgaon and Malegaon. This quantity of seed was sown on an area of 11,355 acres. From the produce of this crop a total quantity of 12,55,750 lbs. of seed has been purchased and stocked for general distribution for sowing in the 1934 season.

Surat Cotton-seed Scheme.—The year under report will go down to history as one in which two tremendous steps were taken to advance the cause of good cotton in Gujarat. The first of these was the final settlement of the outstanding 1027 *v.* 1A controversy. The Indian Central Cotton Committee at its meeting of 29th and 30th January 1934 gave the fullest consideration to this problem which had been the source of trouble since 1926 and which had been the subject of numerous conferences, large and small. All available agricultural and industrial data were brought together and there has seldom been so complete a documentation available for the discussion of any question at the Indian Central Cotton Committee. The matter was very thoroughly threshed out and the Committee unanimously came to the conclusion that it should spend its money only on the propagation of 1027. The Director of Agriculture translated this into action and the Deputy Director of Agriculture, Gujarat, Surat (Mr. B. S. Patel) immediately set to work to carry out the necessary changes. The body which had so long withstood 1027 in favour of 1A, namely, the Sonsek Co-operative Society, showed its reasonableness, good sense and willingness to co-operate, by finally abandoning 1A and coming into the 1027 scheme. During the year

the following amounts of 1027 cotton-seed have been distributed :—

About 15 lakhs of lbs. distributed from Depôts to Surat Farmers.

About $4\frac{1}{4}$ lakhs of lbs. distributed through the Hansot Society.

About $3\frac{3}{4}$ lakhs of lbs. supplied to two States, e.g., Chhota Udepur and Baroda.

It is worth noting that in the history of seed distribution in the Surat District, the Department had never distributed more than $8\frac{1}{2}$ lakhs of lbs. of seed in any year up to now, but during the year under report the Department distributed more than 19 lakhs of lbs. of seed.

The cotton industry in Gujarat, however, had another difficulty which was also promptly and effectively met. This was the gradual increase of the short-staple, high-ginning goghari cotton. This has always been a possible menace to the reputation of Gujarat cotton and its mixing with good cotton was the cause of the débacle in 1919, when over a lakh of bales were rejected in Bombay as not being up to standard. Vigorous propaganda by the Agricultural Department had reduced this inferior cotton to negligible proportions about the year 1923, but during the last two years there have been persistent rumours and complaints that this short-staple cotton was again getting a hold. Mr. B. S. Patel, by personal interviews, leaflets and by collaboration with the Director of Agriculture of the Baroda State has made a tremendous clearance of this undesirable cotton in the current year. This has been largely helped by the collaboration of the gin-owners in both the Bombay and Baroda territories and by influential businessmen in Bombay City. It is hoped that this excellent piece of work will have permanent and lasting effects and that all concerned will remain staunch to good long-staple cotton.

Livestock Work.

Livestock Improvement Act.

In August 1933 session of the Bombay Legislative Council there was passed an important Act affecting livestock. This was Bombay Act No. XXII of 1933 entitled "The Bombay Livestock Improvement Act, 1933." The object of this Act is to give power to Government to order that in specified areas all bulls, which have not been licensed for breeding, shall be castrated. The Act has become necessary, since in

many places the work of breeding from good bulls is in danger of being nullified by the continued activity of "scrub" (i.e., useless mongrel) bulls which are in no way restrained and which are most prolific breeders. The Act, when before the Legislative Council in the form of a Bill, was the subject of great interest and much friendly debate, both sides of the House co-operating to modify the bill to a form that would make it acceptable. Rules to be made under the Act are still in process of being drafted, and hence the Act has not so far been applied in any area.

Premium Bulls.

The following table shows the progress in the system of putting our premium bulls during the year :—

Zone.	Number of bulls working on 1st July 1933.	1st July 1934.
Intensive Breeding Zones.		
1. Chharodi	28	26
2. Surat	7	9
3. Satpura	41	46
4. Sholapur	39	49
5. Belgaum	5	6
6. Bankapur	30	37
The rest of the Presidency.		
7. South Central Division	2	1
8. North Central Division	9	9
9. Southern Division	4	6
10. Gujarat	20	30
Total ..	185	219

The following table shows the total number of pedigree stock registered during the year in each of the main breeds :—

Breed.	Number of animals registered.
Khillar	191
Gir	352
Kankrej	349
Krishna Valley	22
Amrit Mahal	414
Tapti Khillar	55
Nimari	95
Total ..	1,478

At a conference of the Director of Agriculture, the Livestock Expert and the Deputy Directors of Agriculture, it was decided to discontinue the present system of arranging cattle breeding in the Presidency under the so-called "A" and "B" zones. Under the old arrangement, the Livestock Expert was completely responsible for breeding in the "A" zone which was supposed to include places where breeds were more pure and where intensive breeding was to be done. The "B" zone (under the control of the Deputy Directors of Agriculture) included areas where the breeds were less pure and which received bulls that had been produced in the "A" zone. It was felt that it would be far better to restore the whole of the breeding work to the Livestock Expert and to have what would be called "Cattle Breeding Centres" throughout the Presidency, being groups of villages where the Livestock Expert would place premium bulls, the rest of the Presidency being unclassified. This does not mean that bulls may not be procured for places other than "Cattle Breeding Centres", but does mean that no subsidy will be given except in the cattle breeding centres.

Poultry.

The following statement compares the number of Stud Cocks put out during the last two years :—

	1932-33.	1933-34.
Northern Division (includes Bombay Suburbs)	2	18
North Central Division	8	7
South Central Division	62	85
Southern Division	3	8
Native States	20	2
Total ..	95	120

The Bombay Presidency Poultry Association has continued to do good work during the year and in December 1933, held a Show which was bigger than any hitherto held. The site of the Show was also changed from near the Council Hall in Poona to the Fern House in the Empress Gardens, Poona. A very healthy interest in poultry is being taken by various associations, particularly certain of the American Missions. Two of these have agreed to come in a poultry breeding scheme which is now before the Advisory Board of the Imperial Council of Agricultural Research, namely, the American Mission Vocational School and Rural Centre, Vadala Mission, District Ahmednagar and Vocational Training School, Anklesvar, District Broach.

Palghar Dairy District Scheme.

In July 1928, the Livestock Expert drew the attention of the Director of Agriculture to the very unsatisfactory methods then employed in obtaining the Bombay City Milk supply by locating milch cattle in the heart of the City.

There are brought into Bombay City proper annually some 21,000 buffaloes all with calf at foot. Of this number, 25 per cent. of the adults may possibly find their way back to the areas from which they came, the remaining 75 per cent. going to the slaughter house. Of the calves, over 75 per cent. die within a month, and the remaining 25 per cent. may possibly survive up to about the age of 4 months. It will be seen that this large supply of cattle to Bombay City is a great drain on the animal resources of the country and this particularly interests the Agricultural Department in its livestock section.

Cattle owners pay as much as from Rs. 5 to Rs. 10 per buffalo standing per month plus Rs. 10 per buffalo per annum as ground rent. The buffalo thus competes with the human being for accommodation and milk is accordingly expensive.

Milk is a most easily contaminated food and when produced in congested areas, runs every chance of infection. The animals kept in Bombay are fed on coarse dry foods for the whole time they are in the City, thus their milk does not possess those wonderful body-developing properties possessed by milk produced under natural conditions where cattle get good grazing.

Then there is the question of the water supply of the City. Each buffalo consumes or has used on it about 10 gallons of water per day, meaning that about 200,000 gallons of the water supply intended for human consumption is used on the buffaloes located in Bombay. The buffaloes in Bombay are located in some 99 stables scattered all over the City, to say nothing of stables located in the Suburban areas of Bombay.

The Director of Agriculture, after considering the above, formed a Committee in his order dated 18th December 1928 to investigate the possibility of a Dairy District at Palghar as suggested by the Livestock Expert, the 20,000 buffaloes now in Bombay could be located and live a natural life. They could be bred from regularly and their youngstock could be saved and made useful to the country. At the Ahmedabad Show Sir Leslie Wilson, then Governor of Bombay, in his opening address very strongly supported this scheme.

On the 31st August 1929, a meeting was convened in the Bombay Secretariat of members of the Agricultural Department, the Bombay Municipality, the B. B. & C. I. Railway and prominent gentlemen with the Honourable the Minister of Agriculture in the Chair to discuss these proposals. The meeting accepted the proposals and a resolution was passed that a further detailed investigation be carried out; Government issued orders on the above in their Memorandum No. 3246-A/28 dated 14th September 1929, ordering a further investigation report.

The investigation was carried out by the Committee, entailing considerable correspondence with Government, the Collector of Thana, the Chief Conservator of Forests, the Bombay Municipality. Finally on the 10th February 1932, the scheme was submitted to the Director of Agriculture, and the Commissioner, Bombay Corporation.

The Government of Bombay set apart 1,054 acres of land for a trial of the above scheme at the following rental :—

Re. 1 per acre for the 1st ten years,

Rs. 2 per acre for the 2nd ten years, and

Rs. 3 per acre for the 3rd ten years.

This is the present position and it is hoped that from among the enlightened dairymen of Bombay, one or two may take land and make a start in establishing this new Dairy Area. *It only needs a start.*

The Gujarat Boll-Worm Clean-up Scheme.

The actual clean-up work was over by the end of May 1933 and the year under report was utilized for taking observations (1) on the incidence of the boll-worm pest and (2) on the effect of the pest in the crop of cotton. These observations showed that the pest appeared a few weeks later in the central area of the clean-up zone as compared with the time of its appearance in the non-clean-up zone and the yield of crop in the clean-up zone was 25 per cent. better than in the non-clean-up area.

The staff engaged in the Plant Puller Propaganda Scheme financed by the Indian Central Cotton Committee for a period of 4 months did intensive propaganda to educate the cultivators on the pest and the use of plant puller to control it, with the help of magic lantern and field demonstrations. In all 3,500 plant pullers were sold through depôts and other agencies in the year under report.

Now that the Indian Central Cotton Committee has ceased to subsidize this scheme, there may be some falling off in the completeness and timeliness of stump-pulling, but it is hoped that all officers of all departments who have anything to do with the cotton area in Gujarat, will attempt to popularize the use of plant-pullers and to get the cotton stumps out of the ground as early as possible and in any case before the 15th May each year. The Director of Agriculture, who visited the area where intensive work with the plant-puller had been done, was amazed at the growth made by the cotton plants where they had been free from the pest, i.e. the attack by the boll-worm. Instead of short stunted growths the plants were tall with long branches and this good condition was reflected in the yield.

Extirpation of Prickly-Pear.

The extirpation of prickly-pear by the cochineal insect has extended in all directions. A full account of what has been done in the Bombay Presidency has been written by Dr. V. G. Deshpande, Lecturer in Entomology at the Poona College of Agriculture and it is hoped that this will shortly appear in "Agriculture and Livestock in India." Fears have been expressed that the cochineal might leave the prickly-pear and attack other plants. There is not the slightest reason for this apprehension. Actual experiments have been made by the Agricultural Department attempting to cause the cochineal insect to transfer itself to other plants and in no case has there been any success. The cochineal insect in fact is so specialised in its diet that while it destroys the spiny cactus, it will not touch the spineless form of cactus. So that if anyone wishes to plant spineless cactus for the purposes of famine fodder they can do so without fear that it will suffer from the cochineal insect. Complaints have also been made that the killing of prickly-pear by cochineal removes the screen protecting people who are using the neighbourhood of a village for sanitary or insanitary purposes. In so far as the removal of these screens will induce villagers to dig trenches or erect proper latrines, the removal of prickly-pear can only be regarded as an advantage. The most serious complaint has been that the killing of prickly-pear by cochineal removes hedges from crops. This difficulty, however, can be met by the substitution of other plants equally effective as hedges and without the noxious habit of spreading. Mr. Goheen of the American Mission, Sangli, has prepared a useful Marathi bulletin on this subject. Plants recommended by the Bombay Department

of Agriculture are a prickly milk bush known in the Deccan as *Thor* (*Euphorbia neriifolia*) and the small agave (*A. wightii*).

Protection of Crops against Wild Animals.

In spite of the retrenchment of the post of Shikar Officer the work of crop protection is being carried on, admittedly under great difficulties, but with results that are much appreciated everywhere. Mr. P. N. Bhide's work has not only been that of leading and carrying out particular campaigns, but also, and increasingly, in organising chains of gun clubs so that a particular territory may be efficiently protected. Simple rules for the organisation and running of a gun club, and for keeping accounts of the money expended, ammunition used and animals killed, have been devised and are now being made available wherever required. The total numbers of animals killed during the year were 245 pigs, 123 deer, and 23 jackals. The following are a few notes on the various organised groups :—

Poona District.

1. *Sinhagad Group, Taluka Haveli.*—The Mamlatdar of Haveli Taluka is Chairman and the Shikar Officer is the Honorary Secretary of the Sinhagad Group Pig Campaign Committee. The Divisional Forest Officer, Poona, issues the necessary permits to the Secretary and his shikari for hunting and shooting pig in the Reserved Forests. The District Local Board, Poona, gave a grant-in-aid of Rs. 25 to the Pig Campaign Committee. The pig trouble is so much reduced, that only 20 pigs were killed and it has been possible to introduce Spanish peanut as a money crop.

2. *Vir Group, Purandhar Taluka.*—This group is organised to serve as a training camp, training shikaris and dogs and keeping them in practice. It also serves to supply shikaris outside whenever required by the Shikar Officer, e.g., this year this club sent expert " Haran-Shikaris " for work at Hatgaon and Bodhegaon in Shevgaon in the Nagar District. This Club also supplied pig-nets for use on the Belapur Factory area during the pig campaign there. This club killed in its own territory 27 pigs and 22 deer.

Satara District.

3. *Palshi Group.*—A regular shikar party killed 20 pigs. This campaign proved very useful and no need was felt to have a regular campaign for the rabi jowar crop in January. The local gun-club worked on paths and on the crop by moonlight and secured 13 pigs from November to February 1934.

Ahmednagar District.

4. *Pravara Canals.*—The Belapur Sugar Company, Limited, offered co-operation in financing and in the shikar programme of the Gun-Club, to the mutual benefit of the Company and the irrigators. The shikar party killed 34 pigs and its excellent work, especially on the Sugar Factory area, was greatly appreciated.

5. *Mungi Group.*—The Shikar Officer and his assistant were called by this Shikar Sangh to finish off a pair of big old tuskers. This was done. This Shikar Sangh is now registered as a Crop Protection Co-operative Society under the Co-operative Societies' Act. The society has further approached Government to give help in collection of the fund for the pig and deer campaigns at half anna in the rupee on the land revenue and has also requested Government to allow the Society to pay half anna in the rupee on the amount so collected to the Talatis, etc., as extra remuneration, for the extra work. The Collector of Ahmednagar granted one more licence for a S.B.B.L. gun to the President of the Society and 2 licences to 2 members in the Managing Committee for similar guns. The Society thus has 1 D.B.B.L. gun and 3 S.B. B.L. guns and the 2 Shikaris from the village, trained by the Shikar Officer, and the two Managing Committee members, who lead the hunt, will now be able to keep an area of 12,000 acres free from pig and deer trouble. The Society has affiliated itself to the Deccan Agricultural Association, Poona.

6. *Hatgaon and Bodhegaon.*—Deer campaigns were organised at a very cheap cost. Two "Haran-Shikaris" of the Vir Group Gun Club killed 101 deer.

Belgaum District.

7. *Turkewadi Group.*—A Co-operative Crop Protection Society was organised by the Shikar Officer in 1929. The group contains 9 villages. Poisoning of jackals with baits of pieces of flesh with 1 grain of Strychnine hydrochloride contained in a gelatine capsule is done. 23 jackals were killed in the year under report. Also 7 pigs including 2 tuskers were shot. The then Collector (Mr. Madan) inspected the working of the Society and was pleased to grant 6 gun licences. A gun-club is now formed for the three villages of Turkewadi, Mandavle and Mahipalgad with a Central Committee of Management at Turkewadi, on the lines of the Arvatgi system of Gun-Clubs, which involves mainly personal labour of the farmers for hunting in the jungle tract once or twice a week as necessary.

Dharwar District.

8. *Arvatgi Group.*—A successful gun club has been organized here. The Collector of Dharwar was kind enough to issue six licences for guns and joined the pig shikaris into the jungle one day. He gave a pig killing reward of Rs. 10 to this Club. The District Local Board, Dharwar, paid a grant-in-aid of Rs. 25 to the Club. The Honourable Minister for Education paid a visit to this Club and inspected its work. He was pleased to endorse in the Club's Visit Book that the work done has been excellent. The Club killed 113 pigs from July 1933 to end of December 1933.

FRUIT INSPECTION.

During the year consignments of mangoes, pine-apples, papayas, bananas, peaches and oranges shipped by commercial firms from Bombay to Europe were inspected in Bombay, and necessary certificates were issued in each case. In addition, a number of consignments of plants or plant parts sent by the Horticulturist to the Government of Bombay and other private bodies were inspected in the laboratories at Poona. Necessary certificates were issued when the materials were disease-free.

CHAPTER III.

AGRICULTURAL RESEARCH.

In the laboratory and the experimental field plot are produced the results which afterwards are spread by the propaganda staff to cultivators in the districts. The laboratory and experimental plot are, therefore, the "power-houses" of the department and their importance cannot be emphasised too much. Below are given short accounts of the schemes financed by the Imperial Council of Agricultural Research and certain other types of work. These are frankly only a selection from the many that it would be possible to describe and which will be found in the reports of the specialists and of the Deputy Directors of Agriculture.

1. *The Sugarcane Research Scheme for the Bombay Deccan.*—1933–34 has been the first year of regular work on a full programme, the year 1932–33 being largely preparatory. Good progress has been made in classifying and studying the different soil types of the canal areas, and of examining the effect of irrigation on these types. Studies have also been made on the way in which fertility is affected by physical factors, on nitrogen recuperation, on the movement of manures in the soil and on the factors affecting the sub-soil water table. On the side of crop physiology, there has been investigation of the growth of sugarcane under different treatments, study of the root system of cane, of the water and manure requirements of cane, of the conditions that cause cane to wilt, and of the amount of important soil ingredients removed by the cane crop. In the agricultural-management section work has been going on in connection with the comparison of different varieties, and of different systems of treatment with manure. These are large scale experiments laid out in the most approved fashion.

2. *The Dry-Farming Research Scheme for the Bombay Deccan.*—At Sholapur, work began on October 1st, 1933, under the direction of Mr. N. V. Kanitkar, M.Ag., B.Sc., as Chief Investigator, with Dr. J. A. Daji as his right-hand man. There is also a staff of scientific and field workers. The land has been fenced, a laboratory, quarters for certain workers, accommodation for cattle and implements, and a storeroom erected. A well has been sunk, and the land thoroughly surveyed. Methods of work have been devised and standardised, and the rabi crop to be sown in the end of 1934 will

be the first crop that will be the subject of the dry farming investigation work proper.

The Bijapur sub-station which is also under Mr. Kanitkar's direction has been fenced, certain buildings erected, and prepared for the rabi crop. Scientific investigation is also being carried on here on lines similar to those at Sholapur.

3. *The Cold Storage Research Scheme.*—The Cold Storage Research Scheme financed by the Imperial Council of Agricultural Research, mentioned in the last year's report, started its work on 1st March 1934. The mango varieties under trial have been drawn from various provinces, such as Peter and Swarnarekha from Madras, Langra from Bihar and Orissa, and Alphonso from Bombay. The range of temperatures in the seven cold storage chambers is from 30°F to 68°F. A small laboratory has also been equipped in which investigations relating to the rate of respiration of mangoes at different temperatures is undertaken. The chemical study of the changes which take place in the fruit during storage at different temperatures is also in hand.

The results up to date indicate that mango varieties differ largely in their ability to stand cold storage, some ripening beautifully and others blackening and becoming (so far as appearance is concerned) unsaleable. It also appears that below about 40 degrees Fahrenheit the normal life of the mango is so checked that when the fruit is later taken into ordinary temperatures it does not ripen normally. It seems likely that immersion in carbon dioxide may help the keeping qualities of mangoes. It has been possible this year to keep Alphonso mangoes in good condition for six weeks :—

4. *Mango Export.*—The Empire Marketing Board sent through the High Commissioner a report on the four 1933 shipments of mangoes to England. The last two paragraphs of that report summarise their opinion and are given below :

" In view of the small number of shipments and the very limited examination during the 1933 season little can be added to the observations made in the report on the 1932 shipments. The general condition of the 1933 shipments was marred by the presence of blemished fruit. It has already been suggested that such fruit should be graded out.

" The fruit carried in cool storage was green or partially green on arrival and internal browning again occurred in some fruits ripened at the ordinary temperature. It is understood that facilities are now available in India for cold

storage work and doubtless experiments on the best picking maturity and the most suitable temperature for storage will be carried out."

It is certainly desirable not to embark again on mango export before the details under study at the Cold Storage Research Station (in the Ganeshkhind Fruit Experiment Station) are worked out.

5. *Khandesh Cotton-Breeding Scheme.*—The main feature of the year's work has been the isolation of certain strains of Verum cotton with a staple of nine-tenths of an inch. One of these strains is earlier by a week than N. R. cotton, one has about the same earliness as NR and one is about a fortnight later. These strains are also wilt-resistant. If these strains do well on further trials they will be of the greatest possible value to Khandesh, by providing it with a cotton much longer in staple than its present crop, so reducing the short staple area, and to some extent removing the fear of what might happen if the demand for short staple cotton from India were to drop.

6. *Broach Cotton Breeding Scheme.*—Work has been carried on in selecting strains believed to be wilt resistant and subjecting the strains to severe tests. Their progeny are again grown.

7. *The Virus Diseases Research Scheme.*—We are now in a position to attack with confidence a group of plant diseases that are perhaps the most baffling of all the maladies that afflict plants. These are the diseases due to plant viruses. A " virus " cannot be seen under the ordinary microscope, but in some ways it seems to behave like a living thing. A very marked peculiarity of a virus is that it will not multiply except in the body of a living organism. It cannot be grown in an artificial medium as bacteria and fungi can be grown. Certain human diseases are due to viruses, for example, small-pox, infantile paralysis, and, curiously enough, warts. Among plants diseases known to be due to viruses are a whole group called " mosaic diseases " on account of the peculiar spotting of the leaves caused by the virus. Such mosaic diseases are found in sugarcane, tobacco and cucumbers, for example.

Dr. Uppal, Plant Pathologist, has just returned from a long tour in England and America, where he has (at Rothamsted, at the Rockefeller Institute, and at the University of Wisconsin) been working alongside the world's foremost scientists in this branch of research. The Imperial Council of Agricultural Research gave a donation of £500 towards this tour.

It is hoped that the Imperial Council will now provide money for the inception of the Virus Research Scheme, already passed, and only awaiting finance.

Further Schemes.

Of the schemes mentioned last year, the sheep-breeding scheme was sanctioned by the Governing Body of the Imperial Council of Agricultural Research in November 1933 and it is hoped that the money will be made available in 1935. The Goat-Breeding Scheme did not receive the approval of the Governing Body. The Poultry-Breeding Scheme could not be accepted by the Bombay Government on the terms offered by the Imperial Council of Agricultural Research. The Scheme for the Eradication of Hariali Grass by Tractor Ploughing was held over by the Governing Body and will presumably be re-discussed in November 1934. The Koleroga scheme has been the subject of further study and a new scheme may shortly be put up. The Scheme for Enquiry into the Cost of Production of Cotton and Sugarcane and their Rotation Crops, has now completed one year and the results thereof will be discussed by a special sub-committee concerned to be held in Simla on September 9th and 10th, 1934. The Enquiry into the Village Consumption of Cotton was carried out and its results will shortly be presented to the Indian Central Cotton Committee.

The following new schemes have been passed by the Bombay Provincial Agricultural Research Committee for sending to the Imperial Council of Agricultural Research for further action :—

	Name of scheme.	Name of person or persons submitting the scheme.
1.	Research Scheme for the Study of the Deccan Wingless Grasshopper (*Colemania sphenarioides*).	Mr. T. N. Jhaveri, Professor of Entomology, Agricultural College, Poona.
2.	Scheme of research in Apiculture ..	Dr. George, Professor of Biology, Wilson College, Bombay, and Mr. Benjamin Balaram of Vocational Training School, Vadala Mission, District Ahmednagar.
3.	Scheme for Investigation of Problems on Sann Hemp Cultivation.	Mr. V. V. Gadgil, Deputy Director of Agriculture, South Central Division, Poona.
4.	Scheme for Research of Insect Pests of Sugarcane for Bombay Presidency.	Rao Saheb B. P. Vagholkar, Principal, Agricultural Officer, Sugarcane Research Station, Padegaon.
5.	Scheme for Development of Industrial Utilisation of Sann Hemp in India.	Mr. P. B. Advani, Director of Industries, Bombay.
6.	Scheme for Research in Agricultural Economics.	Mr. D. R. Gadgil, Director of Gokhale Institute of Politics and Economics, Poona.

	Name of scheme.	Name of person or persons submitting the scheme.
7.	Poultry-Breeding Scheme ..	Mr. E. J. Bruen, Livestock Expert to the Government of Bombay, Poona.
8.	Goat-Breeding Scheme ..	Do. do.
9.	Scheme for Investigation into the attack on Jowar by the Parasite "Striga".	Professor L. S. S. Kumar, Ag. Economic Botanist to the Government of Bombay, Poona.
10.	Scheme for Investigation of the attack on Tobacco by the Phanerogamic Parasite "Orobanche".	Mr. B. S. Patel, Deputy Director of Agriculture, Gujarat, Surat, in collaboration with Professor L. S. S. Kumar, Ag. Economic Botanist to the Government of Bombay, Poona.
11.	Scheme for Investigation of the Manufacture of White Sugar and Molassein Gul by the Open-pan Process on Poona Furnaces.	Mr. V. V. Gadgil, Deputy Director of Agriculture, South Central Division, Poona.
12.	A Note on Glass House in connection with the Virus Diseases Research Scheme.	Dr. B. N. Uppal, Plant Pathologist to the Government of Bombay, Poona.

Cotton Crop Forecast Improvement Scheme.—Experience had shown over and over again that the Crop Forecasts issued by the Bombay Agricultural Department left much to be desired in the way of accuracy and repeated complaints from the trade made its abundantly clear that an early diagnosis of the trouble was essential. A scheme was accordingly prepared with a view to examine closely the procedure of cotton forecasting in the Bombay Presidency and Sind and to attempt to improve it. This was submitted to the Indian Central Cotton Committee in January last. That body sanctioned the scheme for a period of two years at a cost of Rs. 10,694. The scheme has been actually launched from the 16th June 1934 under Mr. G. R. Ambekar.

Manures and Manuring.

Every agricultural department throughout the world has carried out, on a greater or less scale, experiments on the effects of different kinds of manures and different methods of manuring. The Bombay Department of Agriculture has been no exception to this rule. A mass of data scattered and sometimes confusing, was buried in the reports of the Department and in other publications. This has now been reviewed and brought together by the labours of Rao Bahadur D. L. Sahasrabuddhe, Agricultural Chemist to the Government of Bombay. This involved an enormous amount of work in which Rao Bahadur Sahasrabuddhe was assisted by a statistician Mr. V. Satakopan, M.A. The work was financed by the Imperial Council of Agricultural Research at a cost of Rs. 2,693 The completed work is being published by the Bombay Government as a special publication.

The Agricultural Chemist has also continued to investigate the nitrogen recuperation of Indian soils. Work on this subject also forms part of the programme at the Sugarcane Research Station at Padegaon. It is an astonishing fact that, in the conditions of the Bombay Presidency, the soil does manage to absorb and turn into plant food the nitrogen of the air and thus compensate, to some extent, for the nitrogen removed by crops. It is quite likely that further scientific study of this question may lead to modifications of cultivation methods adapted to different types of soils, ensuring the maximum amount of nitrogen recuperation.

Sulphate of Ammonia is now thoroughly established as a manure, particularly for irrigated crops, and it is very much cheaper than it used to be. The following is a table showing the prices of sulphate of ammonia for the last 8 years. (These are the prices at Baramati, taken as being in a representative cane-growing area) :—

Year.	Price per ton at Baramati.
	Rs.
1926	200
1927	190
1928	170
1929	160
1930	155
1931	150
1932	130
1933	115

In the reports (printed as appendices) of the Deputy Directors and scientific specialists there will repeatedly be found statements to the effect that the results obtained in such and such an experiment were *significant* or not significant. This word *significant* has come to have a special meaning in connection with field experiments. To borrow an excellent phrase from Bowley and Robertson's "Scheme for an Economic Census", *significant* means "*Trustworthy within an assigned percentage*". For most of our work this percentage is taken as 5. In betting parlance, it means that the odds are 95 to 5 or 19 to 1 that the results obtained are really due to the treatment given and not to chance variations of soil, exposure, etc.

In order to obtain results that can be thus interpreted, a special layout of field experiments is required, involving many small plots, so that all the different treatments are

scattered about, among one another. Such layouts are now in use in all the Experiment Stations of the Bombay Department of Agriculture and thus variations due to soil are discounted.

We have, however, also to discount variations due to *season*, and this means that no single year's results can be considered final, but that an experiment with precisely the same layout but on a different part of the farm, must be repeated for several successive years. We prefer to have a straight run of five years to get to a tolerably safe conclusion. To show how results may vary from year to year let me take an example from a carefully planned experiment with different doses and times of application of sulphate of ammonia, along with plots having farmyard manure (given in one dose at the beginning of a six year cycle), and plots having no manure at all. This experiment has had a run of two years on the Surat Farm. The following three columns show (1) the actual treatments, (2) the order of their productivity in 1932–33, and (3) the order of their productivity in 1933–34 :—

Treatments.	Order of productivity in	
	1932–33.	1933–34.
1. No manure (control)	6	8
2. 10,000 lbs. of Farmyard manure once in 6 years ..	3	4
3. 40 lbs. Nitrogen in the form of sulphate of ammonia at sowing.	1	2
4. 20 lbs. Nitrogen in the form of sulphate of ammonia at sowing.	8	6
5. 10 lbs. Nitrogen in the form of sulphate of ammonia at sowing.	7	7
6. 40 lbs. Nitrogen in the form of sulphate of ammonia after stand in August.	2	1
7. 20 lbs. Nitrogen in the form of sulphate of ammonia after stand in August.	4	3
8. 10 lbs. Nitrogen in the form of sulphate of ammonia after stand in August.	5	5

It will be seen that while there is a *general* agreement of results there is not an *exact* agreement. In both years 40 lbs. Nitrogen has been better than 20 lbs. or 10 lbs. But in 1932–33 the 40 lbs. sulphate of ammonia applied at sowing was more effective, while in 1933–34 the sulphate of ammonia applied at stand (i.e. after the plants had made some growth) was more effective. An inspection of the figures will show many other similar points.

The uninitiated may imagine and sometimes loudly express their opinion that experimentation which shows such variation from year to year is useless. But Nature is infinitely variable. Moreover, she cannot be forced, she must be coaxed, and experimentation of the type just described, where the effects of both soil and season are in time cancelled out, does give really trustworthy results, ready for confident recommendation to practical farmers.

Green manuring continues to hold an important place in sugarcane growing and the amelioration of soils, particularly of those poor in humus. The Plant Pathologist to the Government of Bombay has evolved a wilt-resistant strain of sann hemp which when further tested and multiplied can be used in areas where the sann hemp previously died. The provision of irrigation water to encourage the utilization of sann hemp for green manuring continues as a concession on the Nira Right Bank Canal.

CHAPTER IV.

AGRICULTURAL EDUCATION.

Poona College of Agriculture.

The College of Agriculture having taken the shock of retrenchment and of increase of fees has settled down again and appears to be as popular as before, the number of new students attending the College this year being 60 on June 30th as against 45 on the same date last year.

The College was 25 years old this year and celebrated its Silver Jubilee in fitting manner at the annual Social Gathering held in August 1933 when the Honourable Minister for Education, Diwan Bahadur S. T. Kambli, delivered an address.

To assist students to obtain work, the Poona Agricultural Graduates' Employment Bureau has been formed with the Principal of the College as ex-officio president.

It may be of interest to note that the seven sugar factories of the Deccan and Kolhapur employ between them 45 graduates of the Poona College of Agriculture.

The agricultural degree granted by the University of Bombay to students who have studied at the Poona College of Agriculture is no longer B.Ag. (Bachelor of Agriculture) but is now B.Sc. (Agri.) (Bachelor of Science) (Agriculture). The course has been considerably amended and improved. The main change has been the entire abolition of optional subjects. In other words, there will be no specialization before graduation. This change has been accompanied by arrangements to give a better grounding in and much fuller treatment of the fundamental sciences and agriculture itself. The new curriculum came into force from June 1934. As usual, special arrangements are being made during a short period of transition for men who have started on the old course, or who have failed at examinations held under the old regulations.

Vernacular Agricultural Schools.—It will be remembered that four out of the six Vernacular Agricultural Schools were closed as a measure of retrenchment. The two remaining schools continue to do good work. One of these (the school at Devi-Hosur in the Dharwar District) is in its 11th year. The curriculum for both schools has been altered and improved, since it can now be taken for granted that boys entering have

a good knowledge of the 3 R's. Time saved on these subjects is devoted to work more directly connected with agriculture. Poultry work is being given special attention at Dhulia.

Both schools are inspected by the Inspector of Agricultural Schools (Mr. V. C. Pavate) who also inspects Agricultural Bias Classes. These classes are directly under the Department of Public Instruction, and it is understood that that Department has been studying the question of the cost and methods of running them.

Though hardly coming under the formal head of agricultural education, reference should also be made to special classes or courses provided at intervals by various Deputy Directors or specialist officers of the Department, such, for example, as the class (organized by the Deputy Director of Agriculture, South Central Division, and attended by 50 people) on sugar-making by the open-pan process, and the horticultural class organized under the auspices of the Erandol Taluka Development Association with the collaboration of the Deputy Director of Agriculture, North Central Division, and the Horticulturist to the Government of Bombay. There is great need for more money and facilities to extend this type of class both in the districts and at the College itself. The Horticulturist to Government runs a yearly course on all branches of horticulture at the Ganeshkhind Fruit Experiment Station. The Director of Agriculture, Madras, has requested that certain members of the Madras Agricultural Department staff should receive additional training at the Ganeshkhind Fruit Experiment Station.

CHAPTER V.

FINANCE AND ADMINISTRATION.

FINANCE.

The expenditure of the Department in the year under report was Rs. 10,83,430 as against Rs. 11,22,464 incurred in the previous year. The fall in expenditure was mainly due to changes in the personnel of the officers in the Indian Agricultural Service and also in the subordinate Agricultural services resulting in saving in salaries. It was also partly due to the abolition of certain posts in accordance with the recommendations of the Reorganisation Committee and was assisted by the observance of general economy. The receipts of the Department fell from Rs. 2,15,975 in the year 1932–33 to Rs. 1,81,916 in the year under report. This fall in receipts was partly due to the fall in prices of agricultural commodities and partial failure of the late variety of cotton crop on account of the cold wave in January 1934. It was also partly due to fewer sales of the boring machines in the year under report as against those in the previous year.

The following posts have been abolished in the year under report in accordance with the recommendations of the Reorganisation Committee :—

1. Assistant Master at the Vernacular Agricultural School, Dhulia, from 1st November 1933.

2. Watchman at the Vernacular Agricultural School, Devihosur, from 1st April 1934.

3. Manager, Sangvi Cattle Farm, from the cadre of Agricultural Sub-Overseers owing to the transfer of the control of this farm to the Shirpur Taluka Development Association on certain conditions with effect from 1st April 1934. In addition the contingent grant of the Vernacular Agricultural School, Devihosur, has also been reduced by Rs. 500.

The subjoined tables give the amounts of the grants made by the Imperial Council of Agricultural Research and the

Indian Central Cotton Committee for the various schemes and the expenditure incurred therefrom during the year :—

Imperial Council of Agricultural Research.

	Name of Scheme.	Grants.	Expenditure.
		Rs.	Rs.
1.	Sugarcane Research Scheme—		
	A—Agriculture	79,800	78,874
	Add. D. Works	4,786	4,506
	Total ..	84,586	83,380
	Deduct Government contribution	21,500	21,500
	Net grant from the Imperial Council of Agricultural Research.	63,086	61,880
2.	Dry Farming Research Scheme—		
	A—Agriculture	41,447	39,851
	Add. D. Works	22,731	19,331
	Total ..	64,178	59,182
	Deduct Government contribution	5,070	5,070
	Net grant from the Imperial Council of Agricultural Research.	59,108	54,112
3.	Cold Storage Research Scheme	37,989	37,585
4.	Economic Enquiry Scheme	18,264	18,101
5.	Experimental consignment of mangoes to England.	3,210	2,963
6.	Investigation into Virus diseases of plants. (Deputation of Dr. Uppal).	6,667	5,389
	Total ..	1,88,324	1,80,030

Indian Central Cotton Committee.

Serial No.	Name of Scheme.	Grant.	Expenditure.
		Rs.	Rs.
1	Surat Physiological Scheme : Writing up of ..	7,708	7,278
2	Surat Boll-Worm Clean-Up Scheme	36,513	34,613
3	Dharwar Wilt Scheme : Writing up of	1,408	1,172
4	Broach Cotton Breeding Scheme	13,157	9,248
5	Jalgaon Cotton Breeding Scheme	7,525	7,365
6	Hubli Seed Distribution and Extension Scheme ..	8,818	8,155
7	Gadag Seed Distribution and Extension Scheme ..	8,652	8,411
8	Gadag supplementary grant	4,500	4,344
9	Athani Seed Distribution and Extension Scheme ..	4,521	4,168
10	Surat Seed Distribution and Extension Scheme ..	6,115	6,050
11	Khandesh Seed Distribution and Extension Scheme.	35,221	33,773
12	Clerks for the Bombay Schemes	2,718	2,589
13	Small-Leaf Disease of Cotton Scheme	1,828	1,563
14	Village Consumption of Cotton Scheme	844	327
15	Technological Assistant for Surat	4,220	2,866
	Total ..	1,43,748	1,31,922

The following grants were received during the year from Sir Sassoon David Trust Fund :—

		Rs.
1.	Further grant for the investigation in connection with the improvement of grazing lands..	784
2.	Further grant for the testing of new nitrogenous artificial manures ..	1,604
3.	Castor Research Scheme ..	1,817
4.	Further grant for research work on the wilt disease of sann hemp ..	3,853
5.	Further grant for the Vegetable Research Scheme ..	3,628
6.	Power Chaff Cutter Scheme ..	425
7.	Provision of implements for demonstrations on the new canals in the Deccan	1,500
8.	Scheme for research on nitrogen recuperation of soils	3,200
9.	Grant to Dhulia Vernacular Agricultural School ..	500
	Total ..	17,311

In the case of scheme 2 above additional Rs. 1,206 were allotted by the Trustees from the savings available under other schemes.

Administration.

Dr. W. Burns, who was acting in the post of the Director of Agriculture was confirmed in that post on the retirement of Mr. T. F. Main with effect from 26th July 1933, continued to hold charge of that post throughout the year. Mr. V. G. Gokhale, who was acting as Principal, Poona Agricultural College, in addition to his own duties as Professor of Agriculture, was appointed permanently as Principal from 26th July 1933. Mr. Bruen, Live Stock Expert to Government, returned from leave of about eight months on 15th December 1933, and both Messrs. H. G. Baluch and A. K. B. Kazi reverted to their original positions in the department from the same date. Mr. B. S. Patel, Deputy Director of Agriculture, Gujarat, was on short leave of one month and seven days from 3rd January 1934 and Mr. G. P. Pathak, acting Cotton Superintendent, Surat, held charge of the post of Deputy Director of Agriculture, Gujarat, during Mr. B. S. Patel's absence, Mr. H. M. Desai acted as Cotton Superintendent, Surat, during that period.

Mr. W. M. Schutte, Agricultural Engineer to Government, retired from service on 14th November 1933 and Mr. C. G. Paranjpe has, from that date, been appointed as Agricultural Engineer to Government, Bombay, and the post of the Assistant to the Agricultural Engineer in class II of the Bombay Agricultural Service has been abolished from the same date. Mr. K. V. Joshi reverted to the Department proper on the expiry of the Cotton Physiological Research Scheme (financed by the Indian Central Cotton Committee) on 31st July 1933 and was on leave for six months. He joined duty as Deputy Director of Agriculture, North Central Division, from 1st February 1934 and Mr. C. S. Patel on relief from that post proceeded on leave for four months from the same date. He joined his permanent post of Cotton Superintendent, Surat, from 1st June 1934 and Mr. G. P. Pathak, who was acting in it, reverted to his substantive post in the Subordinate Agricultural Service from the same date. Messrs. L. S. S. Kumar and V. M. Chavan continued to act as Economic Botanist to Government and Assistant Professor of Botany respectively. Dr. B. N. Uppal, Plant Pathologist to Government, who was on leave out of India for nearly a year returned on 9th June 1934 and Dr. M. K. Patel and Mr. M. N. Kamat reverted to their original positions in the Department to their original positions in the Department from the same date.

Mr. H. P. Paranjpe, who had proceeded on leave preparatory to retirement on the abolition of the post of District Horticultural officer from 1st April 1932, retired from service from 1st September 1933. Mr. K. B. Naik, Divisional Superintendent of Agriculture, Northern Division, Ahmedabad, who had likewise proceeded on leave preparatory to retirement on the abolition of that post from 1st July 1932, also retired from service from 7th December 1933. Mr. D. P. Mankad, Cotton Breeder, North Gujarat, Viramgam, who had reached the superannuation age on 8th June 1934 retired from service from 9th January 1934 and Mr. G. B. Patel, who was already holding the temporary post of Cotton Breeder, Broach, was appointed to this vacant post from 30th January 1934. Mr. G. B. Patel, with financial assistance from the funds of Indian Central Cotton Committee, has now proceeded on leave for two years and four months for study abroad from 1st June 1934 and Mr. V. M. Majmudar is appointed to act in his place.

A word or two should be said about those officers who have retired during the year under report.

Mr. W. M. Schutte joined the Department as Agricultural Engineer in January 1913. Under his hands the agricultural Engineering section developed in all directions. Boring operations were extensively carried out, pumping plants erected, and much time given to the design of new implements.

Mr. H. P. Paranjpe was first taken up in a non-gazetted appointment in the Department in May 1905 and was attached to the section of the Economic Botanist till he was appointed to the post of District Horticultural Officer from 12th July 1921. During this period he was in foreign service in Mesopotamia from 30th October 1919 to 28th March 1921. He had also acted as Horticulturist to Government for short periods on four occasions. His knowledge both of botany and horticulture is encyclopaedic.

Mr. K. B. Naik first joined the Department in a non-gazetted appointment in May 1909 and was appointed as Divisional Superintendent of Agriculture, Northern Division, from 2nd August 1926. During this interval he had acted in that capacity for short periods on two occasions. His work has helped on the agricultural development of the area in which he worked.

Mr. D. P. Mankad was first recruited for a non-gazetted appointment in the Department in Sind and was mostly employed on cotton work under Mr. Gammie, Cotton Specialist to the Government of India, till 9th August 1921 when he was specially selected, on the abolition of the post of Cotton Specialist, by Mr. Keatinge, the then Director of Agriculture, for the post of Cotton Breeder, North Gujarat, Viramgam. He has had much to do with the evolution of a satisfactory type of Wagad cottons and of its hybrids with 1027 cotton.

Mr. M. L. Patel, Rao Saheb G. L. Kottur and Mr. (now Rao Saheb) S. H. Prayag were absent on leave for short periods and no substitutes were appointed to act in their places. Messrs. W. J. Jenkins, V. A. Tamhane, N. V. Kanitkar, V. R. Dharwarker, R. Y. Hulkoti and Rao Saheb Vagolkar continued on deputation during the year and the following officers held the respective acting vacancies :—

(1) Mr. C. S. Patel acted as Deputy Director of Agriculture, North Central Division, till 1st February 1934 when Mr. K. V. Joshi took his place.

(2) Mr. N. V. Kanitkar acted as Soil Physicist to Government till 1st October 1933 from which date the post of the Soil Physicist has been kept in abeyance owing to the

inauguration of the Dry Farming Research Scheme and the appointment of Mr. Kanitkar as Chief Investigator in charge of that scheme.

(3) Mr. N. Narayana acted as Assistant Professor of Chemistry.

(4) Mr. R. Y. Hulkoti acted as Cotton Superintendent, Southern Division, Dharwar.

(5) Mr. V. C. Pavate acted as Inspector of Agricultural Schools.

(6) Mr. V. V. Gadgil acted as Deputy Director of Agriculture, South Central Division.

Messrs. G. P. Patil, S. V. Shevde and B. P. Deshpande continued to hold the posts of the Divisional Superintendent of Agriculture, Deccan Canals, the Cotton Superintendent, Banilla Cotton Seed Expansion Scheme in Khandesh and the Cotton Entomologist, Broach, respectively, the last having reverted to his permanent post in the Department from 1st May 1934 owing to the closure of the Gujarat Boll-Worm Clean-Up Scheme. Dr. J. A. Daji, Agricultural Overseer under the Agricultural Chemist, has been appointed Assistant Investigator in the Dry Farming Research Scheme at Sholapur financed from the funds of the Imperial Council of Agricultural Research, and Mr. G. R. Ambekar, Head of the Statistical Branch in the office of the Director of Agriculture, has been appointed from 16th June 1934 as Provincial Officer In Charge Cotton Crop Forecast Improvement Scheme financed from the funds of the Indian Central Cotton Committee.

W. BURNS,
Director of Agriculture,
Bombay Presidency.

Poona, 23rd August 1934.

APPENDIX A.

List of Taluka Development Associations organised up to date.

According to the scheme laid down in Government Resolution, No. 3378, dated 5th June 1922, Revenue Department, the number of Taluka Development Associations was 69 at the close of the year 1933-34 distributed over the Divisions of the Bombay Presidency as shown below :—

Division.	District.	No.
Gujarat	Surat	3
	Kaira	2
North Central	East Khandesh	12
	West Khandesh	7
	Nasik	5
	Thana	3
	Kolaba	2
South Central	Poona	3
	Sholapur	2
	Satara	10
	Ratnagiri	5
Southern or Karnatak	Belgaum	4
	Bijapur	2
	Dharwar	7
	North Kanara	2
	Total ..	69

Subsidies amounting to Rs. 42,135 were granted during the year under report (1933-34) as against Rs. 40,469 granted in the previous year.

The Associations have been classed by the Divisional Boards of Agriculture in the order of merit as under :—

Class A—The most successful or efficient.

Class B—Struggling Associations which deserve help if possible.

Class C—Moribund Associations.

Accordingly the number of associations in each class is as under :—

Division.	Class A	Class B	Class C
Gujarat	5		
North Central	9	18	2
South Central	6	13	1
Southern	5	10	

APPENDIX B.

Summary of Work done at the Poona College of Agriculture, for the Year 1933-34.

This is the twenty-sixth year of the College.

Staff.

The total strength of the Staff has remained the same as at the end of the last year.

The undersigned continued to be in charge of the College as Principal being confirmed from 26th July 1933 vice Dr. W. Burns having been confirmed as Director of Agriculture from the same date.

Professor L. S. S. Kumar continued to act as Professor of Botany and Mr. V. M. Chavan as Assistant Professor of Botany throughout the year.

Mr. H. G. Baluch who was appointed to act as Live Stock Expert to Government reverted as Assistant Professor of Animal Husbandry and Dairying from 15th December 1933 relieving Mr. A. K. B. Cazi.

Dr. B. N. Uppal who had been on deputation to England for 1 year returned on 9th June 1934 to his post of Plant Pathologist. Dr. M. K. Patel who acted for him reverted as Assistant Professor of Mycology relieving Mr. M. N. Kamat.

There have been no other changes in the personnel of the staff except a few temporary and permanent changes amongst the subordinate service staff of Lecturers and Demonstrators.

Equipment.

There has been no change in this during the year. It was not possible yet to increase the Library grant so as to make it up-to-date in literature beyond continuing the periodical journals and magazines and only 36 new books. The total number of books in the Library apart from periodicals is thus 7,466.

Curricula.

The revised curricula referred to in the last year's report were finally passed by the University of Bombay for introduction from the academical year commencing from June 1934. The University has substituted the degree of B.Sc.(Agri.) in place of B.Ag. The new course gives a better all round training to the students.

Studentship.

The number of students that attended during the year was as follows:—

Class.	First term.	Second term.
I. Ag.	42	42
Junior B.Ag.	45	45
Senior B.Ag.	54	54

Examination Results.

In the final examination for the degree of Bachelor of Agriculture held in March-April 1934, 61 men appeared and 51 passed making up a total pass percentage of 83·7 as against 89·5 per cent. of last year. The following was the distribution according to optional subjects :—

	Number appeared.	Number passed.
Intensive Study of certain Crops—		
Sugarcane Group	13	9
Advanced Plant Breeding	3	3
„ Agricultural Chemistry	10	9
„ Animal Husbandry and Dairying	10	7
„ Agricultural Economics	9	8
„ Horticulture	14	13
„ Plant Pathology	2	2
Total ..	61	51

In the part examination which may be taken at the end of the Junior year of the B.Ag. course, 45 students appeared for Botany and Plant Pathology. 37 passed in both the subjects, 3 passed in Botany only and 3 in Plant Pathology only and 2 students failed in both the subjects.

In the Intermediate examination in Agriculture, 53 students appeared ; of these, 40 passed, of which 6 were placed in the first class, 26 in second class and 8 in the pass class. One student is allowed to keep terms in the Junior B.Ag. class. The above result gives a pass percentage of 75·5.

Plague.—About the end of August last year, plague in a virulent form broke out in Poona. Many plague affected rats were found dying and 4 deaths of servants also occurred on the College premises. The College had to be closed at once on this account, the University granting plague terms to the students. This interfered with normal teaching.

Comparison with the previous results.—During the last triennium, the passing percentages have been as follows :—

	1932	1933	1934
I.Ag.	69·6	76·1	75·5
B.Ag.	70·7	89·5	83·7

These results show as ever that the teaching done in this College amounting to about six hours per day on an average, two-fifths of which is given in lectures and three-fifths in the practicals, builds up to a high standard the rather poor material which is received at starting in this College.

Special Courses.

The following special courses were given during the year :—

The Kumar Shri Nirmal Kumar Sinhji, brother of His Highness the Maharaja of Bhavnagar (Kathiawar), was given special courses in Agriculture and allied subjects.

Other sectional courses given consisted of Dairying, Veterinary and Chemistry. These have been included in the sectional reports.

The Professor of Agricultural Economics organised an Economic Study circle of the optional Economics students in which many other students participated.

Post-graduate Teaching.

Of the 7 students carrying on post-graduate work under Professors of this College, two completed their work and submitted their thesis, of whom one has been declared to have passed and the result of the other is still to be out, and 3 have left their course unfinished.

Careers of Graduates.

The Poona Agricultural Graduates' Employment Bureau has been established with the Principal of the College as *ex-officio* President since May 1934 to serve as a medium for bringing in a closer touch between our graduates and the possible employing agencies. Uptil 30th June 1934, 20 graduates have registered themselves.

The new Sugar Companies of the Deccan have taken up a large number of our graduades and a census of employment of the batch of 1933 graduates shows :—

I.	*Occupations connected with Agriculture—*		
	(1) Service in Bombay and Sind Agricultural Department ..	15	
	(2) Native States Agricultural Department	6	
	(3) Sugar Factories	10	
	(4) Other private concerns connected with Agriculture ..	8	
	(5) Private farming	2	
	(6) Higher Studies	3	
		—	44
II.	*Occupations not connected with Agriculture—*		
	(1) Service in Government Departments	5	
	(2) State Service	2	
	(3) Educational Service ..	2	
	(4) Other private concerns ..	1	
		—	10
III.	*Unemployed*		19
IV.	*Not known*		4
	Total ..		77

Admissions for 1934-35.

In all, 98 from the Bombay Presidency and 16 outside Bombay Presidency, duly qualified candidates applied for admission to the first year's class and of these, 90 and 9 respectively were given admission. 70 attended actually for some or all days, but on June 30 i.e. 20 days after the new session started, only 60 from the Bombay Presidency and 2 from outside remained permanently as against a total of 45 in the last year. Amongst the new entrants there is one Parsi girl. The number of applicants and of those definitely joining the College seems to be recovering from the set-back which was received by the rumours of the closing down of the College and the increase of fees introduced since last year.

The educational standard of the new applicants from the presidency is lower than in the last year, about one-fifth as against two-fifth of last year having scored above 40 per cent. in their First Year in Arts Examination. All those who have come from universities other than Bombay have to pass Intermediate Examination in Arts or Science. Amongst those joined there are two graduates.

The uniform dress of Khaki short and shirt for students which was introduced partially last year has been general this year.

Admissions for Post-graduate Work.

Including two men who have been registered during the year of report there are this year 4 students carrying on their post-graduate work under Professors of this college recognised by the Bombay University.

Scholarships.

The number of Government scholarships tenable for 3 years continued to be the same as noted in the last year's report.

The Students' Hostel.

The total number of students accommodated in the hostel is 127 whereas there is accommodation for 132 students.

Students' Co-operative Stores.

There were 88 members in all during the year. Out of these, 75 were student-members and 13 Staff-members. The Stores sold materials worth Rs. 8,180-10-6, mostly consisting of food provisions, and the remaining stationery and other requisites. This yielded a dividend of 6¼ per cent. on the share capital and about 5 per cent. rebate from the market price of goods sold. There is scope for a much larger business, with better management and educating the members in the real advantages from co-operation and to be thoroughly loyal and vigilant.

Athletics and Social Activities.

The standard of efficiency of the College Gymkhana continued to be high. The playground was fully made use of under the inspiring and active association of Dr. Cheema as the Chairman of the

Gymkhana. On account of plague, Inter-collegiate sports were not held this year.

This College, in spite of its reduced strength of late, contributed one U.T.C. platoon as usual under Assistant Professors K. S. Kulkarny, 2nd in command, B company, and V. M. Chavan, 2nd Lieutenant. The platoon carried off four prizes during the camp sports and contributed towards the Hockey team, Tug-of-War team and swimming. The Rover Scout troops did good social work under the guidance of Professor J. P. Trivedi.

Silver Jubilee Social Gathering.

The Silver Jubilee Social Gathering was celebrated on 26th August 1933 when Diwan Bahadur S. T. Kambli, Minister of Agriculture and Education, Government of Bombay, presided and addressed the students and distributed the prizes. Many distinguished guests honoured the function by their presence.

Students' Literary Activities.

The Poona Agricultural College Magazine.—This was continued as in the past under the management of students ably assisted by a staff-editor in Professor L. S. S. Kumar.

The Agricultural Association and Debating Society had a fairly good programme of meetings.

Students' Guardianships.

The tutorial system instituted during the year under report was successful and established personal and friendly relations between the staff and students, thus ensuring better looking after the students' welfare while in the College.

Aid and Assistance to the Public.

Veterinary Hospital.—Apart from the main purpose of practical instructions to the students of the College it has continued to do service to the public as in the past.

The number of in- and out-patients during the year was 463 and 4,683 respectively.

Research and Advice.

All the staff of the College have carried on research and advisory work in the time available after satisfying the needs of teaching and administration of their respective sections. Summaries of such research and advisory work are embodied in the reports of the respective heads of sections which are appended to the Annual Report of the Department.

Visitors.

Amongst the distinguished visitors whom the College had the honour of receiving during the year, the following may be prominently mentioned :—

(1) His Excellency the Right Honourable Sir Frederick Hugh Sykes, then Governor of Bombay, who visited the Agricultural Co!l ege Dairy.

(2) Three experts of the Economic Enquiry Committee, viz. Professor A. L. Bowley, Mr. C. Fazal and Dr. P. J. Thomas.

(3) Dr. Shaw, Imperial Economic Botanist to Government of India.

(4) Dr. Hudson, Deputy Director of the Bureau of Plant Genetics, Cambridge.

(5) About 25 delegates from the Indian Science Congress.

(6) Mr. M. Vaidyanathan, Statistician to the Imperial Council of Agricultural Research.

(7) Mr. S. Satyamurthy, Syndic, Madras University.

(8) Mr. Mahbub Alam, Rice Specialist to the Government of Bihar.

(9) Professor R. N. Tewari of the Benares Hindu University.

V. G. GOKHALE,
Principal,
College of Agriculture, Poona.

COLLEGE OF AGRICULTURE :
POONA, JULY 18th, 1934.

APPENDIX C.

Summary of Work done under the Deputy Director of Agriculture, North Central Division, for the Year 1933-34.

Introductory.

This division comprises three Deccan districts of East Khandesh, West Khandesh and Nasik and two Konkan districts of Thana and Kolaba. The rainfall in all these districts began unusually early but was followed by a long break. Thereafter it was generally in excess but its distribution was fairly even. The yields of both kharif and rabi crops were fairly good except in the Nasik District, where the bajri crop suffered considerably due to heavy rains. This district was also severely hit by another calamity, namely, the three spells of intense cold in January 1934. These damaged most of the grape gardens and killed banana and vegetable crops of brinjals, chillies, tomatoes, etc., outright. The irrigated rabi crops in the submontane country were also similarly killed. Sugarcane dried up in the growing shoot and the resulting yields were low and of poor quality. In the hot season the onion in Niphad was infested with thrips. In Thana and Kolaba, mango suffered heavily from attacks of hoppers of an unusual virulence.

The slump in prices of agricultural produce continued. Rice and groundnut underwent further falls in demand and prices and there is a general cry for relief. Although the trade depression is world-wide, some relief is possible by way of protection against unfair competition, convassing for more outside markets, regulating trade allowances, weights and measures, providing cheaper transport facilities and improving methods of cultivation by introduction of labour saving implements, better varieties and new crops, cheaper manures and control measures against pests and diseases. The Agricultural Department has been helping the cultivator in as many of the abovementioned directions as possible as will be seen from the details of work reported below. The question of improvement of prices is receiving serious attention from the Government of India and it is hoped that some tangible practical results may accrue in the near future.

I. RESEARCH AND EXPERIMENT.

Research and experimental work is carried on at two institutions viz. the Jalgaon Farm (East Khandesh) and the Rice Research Station, Karjat (Kolaba). Cotton, jowar and wheat on the Jalgaon Farm and rice at Karjat are the crops under investigation. In the Girna canal tract, experiments on irrigated crops of cotton and wheat were conducted at Aghar (Nasik).

COTTON.

(*a*) *Plant breeding work.*—As stated in last year's report the principal line of work is of isolation of cotton races homozygous for wilt-resistance and selection of wilt resistant types of good commercial value.

Among the varieties studied in the various species of Neglectums, three strains No. V. 57–7, 56–3 and 56–17 have given indications of promising results so far. Their chief characteristics are that they are highly wilt-resistant and have much better fibre than either N. R. or Banilla. All the three types have the staple length of about 23 mms. and their spinning value is adjudged to be in the neighbourhood of 30's standard warp counts. The percentage of wilt incidence of these was found to be 15, 18 and 9 respectively. These strains will therefore be put to rigid yield trials in the ensuing season.

Critical testing of selections found to be wilt-resistant is in progress. The 13 types which have given promising indications will be carried over for further test in the coming year.

(*b*) *Manurial experiments.*—Experiments on cotton manuring were started this year in replicated and randomised plots. Both bulky and concentrated manures were tried. As this is the first year of the work, no conclusions can be drawn. The results will be published in the experimental record.

JOWAR.

(*a*) *Plant breeding work.*—The work of isolation of desirable strains in Aispuri variety of jowar suitable for Khandesh conditions was continued by the Cotton Breeder on the Jalgaon Farm. Of the individual selections made in the previous year, two strains Nos. 17 and 41 had the outstanding feature of long and compact earhead. The total number of selections is 16. The purity and yield of the promising strains remains to be tested.

(*b*) *Grading of seed.*—An experiment of graded versus non-graded farm seed was carried out on the Jalgaon Farm in five replications. The difference in yield is small and is not statistically significant. The experiment will be continued with the addition of cultivator's seed in the series.

WHEAT.

(*a*) *Effect of passing a roller on the crop in the seedling stage.*—A roller was passed over wheat crop, two and three weeks after sowing. This had the effect of encouraging tillering and delaying the crop with no advantage in yield. The late crop suffered comparatively more from rust.

(*b*) *Effect of mixing fertilizers with seeds on their germinating power.*—An experiment to see the effect of mixing wheat seed with sulphate of ammonia and bone-superphosphate either singly or in

combination for varying period prior to sowing was made. The results show that :—

(1) Seed mixed with sulphate of ammonia for various periods up to two days prior to sowing, has no injurious effect on germination.

(2) Bone-superphosphate, on the other hand, begins to affect germination even when mixed at the time of sowing. The adverse effect rises rapidly with increase in the period, between mixing and sowing. Contact for one and two days lowers the percentage germination from 86 per cent. to as low as 47 and 11 respectively.

(c) *Wheat manuring* (*Dry crop*).—Sulphate of ammonia and bone-superphosphate were given at the time of sowing, singly and in combination at the rates of 20 and 56 lbs. per acre. The results bring out that sulphate of ammonia is effective enough to pay its way and leave a profit of nearly Rs. 4 per acre. The experiment will be repeated.

RICE.

The studies on manurial requirements of the rice crop and the effects of sulphate of ammonia on the quality of grain and straw, as also on the soil were continued at the Rice Research Station, Karjat. The results are summarised as under :—

I. The time and quantity of nitrogen (*sulphate of ammonia*).

The quantities (40 lbs. and 60 lbs. N. per acre) given in three different doses (i.e. in 1, 2 and 3 doses) and a control, were compared in one guntha plots, in five replications with the following results :—

1. Application of nitrogen in all the six treatments has substantially increased the yield of both grain and straw over no application. The increase in grain with 40 and 60 lbs. nitrogen has been to the tune of 65 and 85 per cent. respectively over the control. These increases are statistically significant.

2. Although, application of 60 lbs. nitrogen per acre has resulted in bigger yield than that of 40 lbs., it has not given a larger margin of profit. The net profit in the two cases has been more or less the same. Application of 40 lbs. nitrogen per acre is therefore more profitable.

3. A comparative study of the effects of applying the same quantity of nitrogen in one or more doses on yield shows that it is more or less equal and therefore application in three doses is safer in practice where the crop depends upon vagaries of the rain.

II. Results of other Investigations.

The investigation into the effects of continuous application of sulphate of ammonia to rice fields was continued. The results confirm the findings of the previous years, that the lime content of the soil is reduced, acidity increased and organic matter depleted. The grain and straw contain less proteids. Investigations to ameliorate these adverse effects have not borne fruit so far.

Although, therefore, the work at Karjat has proved that rice is benefited by the application of nitrogen and that it responds best to sulphate of ammonia, the findings in the foregoing paragraph strongly speak against the use of this fertiliser as a field manure. Future work must therefore be directed to find out the next best form of nitrogen for rice manuring.

IRRIGATION FARMING.

The Aghar demonstration plot on the Girna canal was closed during the year after running it for four years. This is because the establishment of the sugar factory at Ravalgaon has changed the position of water supply to crops other than sugarcane on this canal. The experience gained on the Aghar plot during the four years may be summarised below :—

(1) In the Girna canal tract, Banilla cotton comes up well on one preseasonal waterings.

(2) Spanish pea-nut groundnut forms a good rotation in the cropping programme of the tract.

(3) For irrigated wheat, half the usual quantity of farm yard manure, can be economically replaced by 150 lbs. groundnut cake, 112 lbs. superphosphate and 80 lbs. nitrate of soda or sulphate of ammonia, per acre.

(4) Sann manuring for wheat although effective has not been economically successful, as the loss of the bajri crop involved in the system cannot be fully compensated.

(5) Chavli (Vigna Catiang) and udid (Phaseolus Mungo variety Radiatus) grown for green manure do not thrive well.

II. AGRICULTURAL SERVICE AND PROPAGANDA.

The knowledge derived from agricultural research and experiment fructifies itself in its counter-part—the propaganda which is carried to the very door of the cultivator through a variety of activities. The means to this end are :—

1. Village demonstrations of improved varieties of crops, manures, implements and treatment for plant-pests and diseases.

2. Opening stores for supply of seeds, manures, implements, insecticides and fungicides.

3. Organising transport, marketing and sales of improved crops.

4. Dissemination of the knowledge of the principles, practice and improvement of agriculture through special agricultural schools, agricultural bias classes in vernacular schools, seasonal agricultural and horticultural classes for adults, jamabandi lectures, distribution of leaflets and magazines, agricultural news in local newspapers and magazines and answering queries.

The district staff takes the lead in all these lines of activities and is responsible for doing the spade work. It is also on a constant look-out for various undeveloped agricultural potentialities of each tract and organises work to tap them. The preliminary work is followed up and supplemented by the Taluka Development Associations and to them is due the credit of the extensive propaganda and service in the cause of widespread supply of improved seeds, manures and implements. This is particularly the case in Khandesh and northern and central parts of Nasik. The work carried out in the various channels mentioned above may now be summarised.

COTTON.

This forms the principal crop of Khandesh and a good deal is being done for its improvement. Mention has already been made of the research work under way, for evolving a type of cotton which will combine the characters of wilt resistance, longer staple and high yield. In the meantime, Banilla cotton which has a superior staple and which gins about five per cent. more is being pushed forward. This is being done with the aid of the organisation financed by the Indian Central Cotton Committee and referred to on page 52 of last year's report. The seed distribution scheme embraces a wilt-free zone of six talukas, viz. Shirpur, Amalner, Erandol, Pachora, Chalisgaon and Malegaon. The plan of this organisation is to multiply annually pure seed of Banilla cotton by growing it through four successive stages and thus raise a quantity which will be enough to sow about 1,00,000 acres. This is the third year of the Scheme.

During the year under report there were 6¼ acres under stage I, and 1,100 lbs. of selfed seed was obtained from the crop. Under stage II on the Bhadgaon Farm, an area of 103 acres was sown with selfed seed, giving a return of 20,000 lbs. of pure seed. Under stage III in the Bharwas village-group, 37,700 lbs. of pure seed including that produced on Bhadgaon Farm last year was distributed and sown on an area of 1,359 acres. This yielded 1,76,410 lbs. of purified seed. Under stage IV, a total quantity of 3,73,253 lbs. of seed was distributed among registered seed growers in 100 villages in the talukas of Amalner, Shirpur, Erandol, Pachora, Chalisgaon and Malegaon. This quantity of seed was sown on an area of 11,355 acres. From the produce of this crop a total quantity of 12,55,750 lbs. of seed has been purchased and stocked for general distribution for sowing in the 1934 season.

In addition to the distribution of seed in the multiplication areas mentioned above, 2,11,441 lbs. of seed was given out for general cultivation. Of this 1,39,361 lbs. were distributed in Khandesh and Nasik and 22,720 lbs. were sent to Deccan canal areas. A quantity of 49,330 lbs. was sold outside the Bombay Presidency—36,000 lbs. in Parbhani tract, 13,000 lbs. in Dhar State and 330 lbs. sent to other places.

During the coming season, after meeting the requirements of stage IV, a quantity of about 10,00,000 lbs. of seed is expected to be available for general distribution.

On the Bhadgaon Farm (stage II), the crop, grown with a preliminary irrigation, gave a yield of 700 lbs. per acre and the dry crop yielded 300 lbs. of seed cotton per acre on an average. In the district, the yields varied from 200 to 350 lbs. of seed cotton per acre and the ginning percentage ranged from 40 to 42. Banilla cotton fetched from Rs. 11-8-0 to Rs. 14-12-0 per maund of 168 lbs. as against Rs. 10-0-0 to Rs. 12-0-0 for local cotton. The lint fetched a premium of about Rs. 10 per candy over the local. Samples of lint of Banilla and local cotton were sent for spinning test. The average performance of the Banilla cotton is equivalent to 14's standard warp counts as against the 10's counts of the local.

In trials on the Dhulia School Farm conducted in eight replications by the Cotton Breeder, Banilla gave 19·5 per cent. less yield than farm N. R. cotton. This decrease was however more than counter-balanced by the higher prices realised for Banilla, thereby giving a net gain of Rs. 1-2-0, per acre over Farm N. R.

Banilla cotton is also popular in areas in which the crop suffers from wilt disease. The Jalgaon Farm is situated in this area. From this farm 9,000 lbs. of Banilla cotton seed was supplied to the Taluka Development Associations at Jalgaon and Bhusawal for distribution. This was sown on an area of about 454 acres. The crop was purified by the staff of the Agricultural Department. About 87,000 lbs. seed from this crop has been purchased for distribution. The Taluka Development Association, Jalgaon, has also obtained 20,000 lbs. of Banilla seed from other cultivators for supply to intending growers next season.

It is estimated that the total area under Banilla cotton in the whole of Khandesh was in the neighbourhood of 1,20,000 acres and in certain markets like Amalner, the general level of quality of cotton has distinctly improved on account of large arrivals of Banilla there.

The Indian Central Cotton Committee have also sanctioned a scheme of enquiry into extra-factory or village consumption of cotton for a period of six months. This enquiry was started in January 1934. The results will be reported next year.

The regulated cotton market at Dhulia organised with a view to control rates of commissions, weighments and disputes completed its fourth season of working. It continues to be popular. The arrivals were 41,487 cartloads of seed cotton, 1,196 of lint and 36 of waste cotton. The Market Superintendent settled as many as 288 disputes and only six disputes were referred to the dispute sub-committee. The total receipts amounted to Rs. 8,288-13-3 on account of fees and other sundry receipts. Mr. N. V. Bhagwat, Inspector of Agriculture, Khandesh, was the Government Nominee on the Market Committee and his presence there proved of great use in overcoming certain obstacles which once threatened the smooth running of the market.

The preliminary work of establishing a similar regulated cotton market for Amalner is over and it is now certain that this market, which will be the second of its kind, will begin to function, from the next cotton season.

GROUNDNUT.

Although of recent introduction, groundnut has been the most favourite money crop of the Khandesh cultivator. It has not only added materially to his wealth but has also stimulated the oil industry of the tract. There are now in Dhulia, not less than 165 expellers in 12 factories, and the arrival of the crop in the Dhulia market alone is estimated at 75,000 cart-loads of nuts. The steady increase of acreage under this crop however has received a check and the area during the last quinquennium has been more or less constant in the neighbourhood of 4,50,000 acres. The chief reason for this seems to be the phenomenal fall in the price realised. During the period of 1922 to 1928, groundnut pods fetched from Rs. 20 to Rs. 23 per palla of 240 lbs. The rate came down to Rs. 16 in 1929 and to Rs. 9 in 1930. It however rose to Rs. 15 in 1931 but again fell in 1932 to Rs. 7 and during the year under report it was as low as Rs. 6-4-0 per palla. This slump in prices makes groundnut cultivation a losing concern and it is greatly apprehended that the area under this crop may decline to a marked degree, unless prices improve. The marketing organisation also needs control with regard to weighments, rates and items of commission, etc., as in the case of cotton. A case is therefore being prepared for a regulated market.

The district staff continued to supply pure seed of the spanish pea-nut variety. During the year under report, not less than 1,00,000 lbs. of seed was distributed with the help of the Taluka Development Associations. Arrangements have also been made to renew the seed from the United States of America for sowing on the Jalgaon and Bhadgaon Farms in the ensuing season. The produce of this seed will be distributed to registered seed growers who will reserve their purified produce for further distribution.

WHEAT.

Mention has already been made in the last year's report about the new strains of wheat Nos. 224, 162 and 168 that are given out to replace the local varieties in Khandesh. Of these, strain No. 224, which is later by a week to ten days than the local, has been found to be more suited to the eastern Tapti valley up to Amalner. Village trials carried out with this strain confirm last year's results, viz. that it is superior in yield to the local wheat and the grain fetches from Rs. 2 to 3 more per map of 760 lbs. on account of its better lustre.

During the year under report as much as 18,480 lbs. of seed of strain No. 224 sufficient to sow 243 acres was supplied to 12 cultivators in the villages of Mamurabad, Dharangaon, Zurkheda and Chapgaon. Arrangements have been made with progressive landlords to store all the produce for further distribution for seed purposes. The seed was also multiplied on the Jalgaon Farm and there is a stock of 16,000 lbs. available for distribution.

In Western Tapti valley strain No. 162 was being distributed in previous years and it has spread to the extent of about 10,000 acres. Village trials of strain Nos. 162, 168 and local, showed that both Nos. 162 and

168 are superior in yield to the local wheat. Of the two again, strain No. 168 yields better. This strain ripens earlier by about a week and has grain of better lustre. On this account, it is preferred by the people and is, therefore, encouraged. There was already an area of about 100 acres under this strain in the district and a part of the produce is being made available for seed distribution. Arrangements to multiply the seed in large quantities were also made on the Jalgaon Farm and a quantity of 22,000 lbs. is held in stock there. Our future policy in the western Tapti valley will be to discourage wheat No. 162 and give out 168.

In the Nasik district also, as in Khandesh, we have now got an improved strain of wheat known as Bansi-palli (wheat No. 808, a cross between Bansi and Khapli). This is being tested in various centres for the last three years. Comparative trials of this strain made with local and another competing strain No. 168, showed that both the improved strains give more yield than the local, strain 168 being slightly superior. It tillers better but being late is susceptible to the attack of rust. Wheat No. 808, on the other hand, is earlier by ten to fifteen days and therefore escapes rust disease. The character of earliness is indeed a point of great importance from agricultural stand-point for a dry crop. People have therefore preferred the Bansi-palli wheat and are multiplying it.

During the year under report 12,970 lbs. of this seed were distributed in the Niphad, Nasik and Sinnar talukas covering an area of about 216 acres.

Wheat No. 808 was grown on the Jalgaon Farm in Khandesh for seed multiplication and we have now on hand 6,000 lbs. of pure seed for distribution. This seed will be given out for multiplication to central private seed farms and some progressive registered seed growers in certain groups of villages.

A very welcome improvement of green manuring to wheat with sann is taking place in Shahada and Nandurbar talukas of West Khandesh as stated in last year's report. During the year under report, as much as 30,000 lbs. of sann seed was distributed in this tract and for the ensuing season the demand is on an increase. In Shahada taluka alone the area green-manured with sann is estimated to have gone up from 10 acres in 1930-31 to 600 acres in 1933-34.

Compared to dry wheat, the area under irrigated wheat is small, although it forms an important crop in tracts of Nasik and Khandesh, having irrigation facilities from rivers and wells. In this tract Pusa No. 4 wheat has now largely replaced the local Mondhya and Bansi varieties which are very susceptible to rust. As however these varieties are still grown, the Pusa wheat seed in the locality gets mixed and arrangements are required to be made to renew the seed. During the current year 2,480 lbs. of seed was obtained from Pusa and supplied. From the ensuing year, the seed supply will be organised on the system of perpetual renewal through private central seed farms and village registered seed growers to be described later.

JOWAR.

In Khandesh, the Maldandi variety of rabi jowar is steadily spreading in the trans-Tapti tract. This is particularly gaining ground in Shahada taluka where the Taluka Development Association distributes the seed. The area under this variety is estimated at 600 acres.

In Yeola taluka of Nasik, both Maldandi and Dagdi varieties have been found to be better yielders than the local. During the current year the Yeola Taluka Development Association distributed 1,680 lbs. of seed.

BAJRI.

Akola bajri which has established its reputation as better yielder was distributed to the extent of 9,000 lbs. in Khandesh, and 5,481 lbs. in Nasik. The Agricultural Overseer, Malegaon Sub-division, has devised a seive for grading bajri seed. The seed so graded gave on an average, 4 per cent. more yield, the cost being negligible.

An experiment has been in progress for two years in the Girna canal tract to see if sann green manure to light soils in alternate years with bajri would be profitable. Sann crop puts forth poor growth and is not able to compensate for the loss of the bajri crop. Spanish pea-nut groundnut tried as a rotation crop with bajri also gave uneconomic results.

RICE.

Of the two late strains, K42 and K226, the former is in demand in Kolaba and south Thana tracts and the latter in north Thana. In Kolaba district, 9,787 lbs. seed of K42 was distributed. In south Thana the distribution amounted to 2,990 lbs. given to 15 seed growers and the Inspector of Agriculture, Kalyan, estimates that an area of about 4,000 acres was under this strain in south Thana.

K. 226 is preferred in North Thana for its fineness and the quantity of seed distributed amounted to 1,570 lbs. among 19 seed growers. In addition to the distribution done by the district staff, the seed growers and the landlords carry on the work on their own accord from their preserved stocks and it is estimated that they distributed 16,240 lbs. of seed. In addition, there is also some natural spread. The people however want a still finer grained type and this has been brought to the notice of the Crop Botanist. In Kolaba and south Thana, 874 lbs. and 1,020 lbs. of this strain were given out respectively.

Strain No. 184, suited for early fields, is given out in both the districts, the quantities distributed to seed growers being 1,092 lbs. in Kolaba, 105 lbs. in south Thana and 835 lbs. in North Thana. In the last tract alone, it is estimated that a quantity of 11,950 lbs. of seed was further distributed by seed growers and landlords from their stocks.

The intermediate type K153 is not much appreciated and hence its distribution is very poor. Strain No. K540 is being tested instead.

With regard to the early and intermediate types, the demand of the people is to have high yielding strains among the existing coarse varieties which they prefer for home consumption.

Nasik district is known for its scented varieties of rice and it has not been possible for the Department to carry out any plant breeding work for evolving higher yielding types. Village trials carried out with the Gujarat variety of Kamod (Pankhali Kamod) showed that it yields equally well and has a finer grain and may command better price. Further trials will be carried out.

In the Igatpuri taluka, village trials with Kolamba Nos. 42 and 226 showed that both of them are superior to the local kolpi in yield and in price. The seed is being distributed.

NAGLI. (ELEUSINE CORACANA.)

Improved Nagli strains Nos. B11 (early), E31 (intermediate) and A16 (late) are being popularised in North Thana and as a result it is estimated that an area of about 1,000 acres has come under these types. In south Thana, strains Nos. E31 and E82 promise to do better. Further trials are needed.

IRRIGATION FARMING.

There is a growing tendency to take to irrigation farming and fruit cultivation in favourable localities all over the division. Nasik is extending grape cultivation towards Niphad and is specialising in vegetable cultivation particularly the tomato for supply to the Bombay market all the year round. Parts of Nasik and Khandesh with water and transport facilities to large markets in Upper India are concentrating on fruit culture of plantains, mosambis, santras, lemons and mangoes. In the Thana district along the G. I. P. and the B. B. & C. I. railway lines, new vegetable, flower and fruit gardens are springing up.

The total area under irrigated crops in Khandesh in 1930–31 was 52,780 acres which rose to 60,244 acres in 1931–32. In the following year the acreage went up to 61,963. The number of inquiries received for advice in laying out gardens, supply of grafts and seedlings, root-treatment, pruning and control of pests and diseases have considerably increased. The Horticultural Sub-overseer, Khandesh, prepared as many as 1,432 mango grafts of Neelum, Totapuri, Alphanso and Borsha varieties under requisition. He budded about 400 wild bor trees with the Mehrun variety and 505 buds of mosambis and oranges on jamburi stalks. The district staff and the Taluka Development Associations all over Khandesh supplied about 10,000 plants of oranges, mosambis, chikoos and guavas, in addition to 5,000 suckers of plantains. Of the former, Erandol, Pachora and Bhusawal took 2,200, 2,100 and 4,000 plants respectively.

In Nasik, fruit cultivation is extending in Nandgaon and Chandor talukas. During the year, 271 Alphanso mango grafts, 85 orange, 157 mosambi, 4 seedless guava plants, 120 Mehrun bor buds and 16 ounces seed of Washington papaya were supplied. A new enterpriser in Chandor in citrus cultivation was cheated by a nurseryman, in that, the plants supplied proved to be only jamburies. Arrangements to put lemon buds on them were made.

In the Bassein tract of Thana district, noted for its plantain (the Basrai) a new selection "Mhas" has been made by a planter. This is known for its bigger size of fruit and yellowing of its skin on ripening. 2,050 suckers of this type were supplied through departmental agency. In North Thana, the Agricultural Overseer supplied 725 mango and 215 chikoo grafts. In South Thana, 250 mango grafts were supplied and arrangements were made to teach methods of grafting to interested cultivators. At Murbad, a mango nursery is in making and the owner proposes to prepare 2,000 grafts next year. Budding of wild bor trees with Mehrun variety is steadily progressing in South Thana and Kolaba where 200 and 93 buds were put on respectively.

The demand for seeds of vegetable and fodder crops increased all over the division. In Khandesh, the district staff and the Taluka Development Associations supplied 1,600 lbs. in aggregate, of seeds of onions, bhendies, guvar, cabbage, knolkol. etc. Besides, about 900 lbs. of lucern seed was also given. In the Malegaon sub-division orders for vegetable seeds worth Rs. 90 and 542 lbs. of lucern were complied with. Italian potatoes were introduced in Chandor Mahal with success and 3,000 lbs. of seed potatoes were supplied.

The establishment of the sugar factory at Ravalgaon on the Girna canal has been of considerable use in the demonstration of improved methods of sugarcane cultivation and comparative growth of new varieties. The most promising of the new varieties are Co. 290 and EK28, the former to replace Khadya and the latter Pundya. Another superior variety is P. O. J. 2878, but it is too hard a cane for bullock-driven crushers. The former two types are being distributed in Kalvan, Chandor, Nasik and Niphad talukas as sets become available.

TRIAL OF NEW CROPS.

Fodder crops such as sundia jowar, maize, Guinea, Elephant and Sudan grasses and chavli which are found to grow successfully in the Bombay Suburban areas, are being popularised among milkmen, Goshalas, and Panjrapoles. On varkas lands in Thana and Kolaba, tobacco is showing promise of success.

In the Malegaon Sub-division, crops of tapioca, and Rheana, Sudan, Guinea, and Elephant grasses are being tried. Among vegetable crops, garden peas, French and broad beans are introduced. Tobacco and cotton were tried in east Sinnar with success.

MANURES AND FERTILIZERS.

With the rise in irrigated crops, the demand for manures and fertilizers is also rising. During the year under report, as much as 320,050 lbs. of oil-cake (castor and groundnut) and 300,000 lbs. of sulphate of ammonia were sold in Khandesh by the Taluka Development Associations. A quantity of 27 tons of undecorticated groundnut cake was also purchased by the cultivators at Mhasavad in Jalgaon taluka for cotton crop.

In the Nasik district, in addition to large sales of fertilizers sold by agents of the Imperial Chemical Industries, the Taluka Development

Associations of Satana, Malegaon, Yeola and Ozar-tambat, sold 441,612 lbs. of sulphate of ammonia, 71,032 lbs. of oil-cake, 3,600 lbs. of Niciphos and 1,380 of nitrate of soda.

In North Konkan, the use of sulphate of ammonia as a complete or partial substitute of *rab* continued to be advocated. About 10 tons of sulphate of ammonia in North Thana, and 5 tons in South Thana are reported to have been sold by the agents of the Imperial Chemical Industries, for this purpose. Niciphos is also being tried and is considered to be a better substitute in the Kalyan tract.

Sulphate of ammonia and Niciphos are also in great demand in Thana tract for vegetable, flower and fruit gardens. It is understood that the agents of the Imperial Chemical Industries Ltd. sold an aggregate quantity of 111 tons to such gardens.

The use of bone-meal, and denaturalised salt for manuring cocoanuts, mangoes and chikoos continues. During the year under report, it is estimated that about 22 tons of bone-meal were used and permits for 2,725 maunds (Bengal) of denaturalised salt were issued.

IMPROVED IMPLEMENTS.

In Khandesh, the number of iron ploughs sold by the Taluka Development Associations and the district staff was 150 and that of plough shares 800. Besides these, a considerable amount of help is rendered by the implement depôts of all the Taluka Development Associations and those of the Agricultural Department which keep a large stock of ploughs for hire. The total amount of hire charges on ploughs earned by these amounted to Rs. 2,560 and 350 respectively. The business of plough hire is also being done by private agencies.

The departmental tractor was in great demand for ploughing but due to an accident, it could not work throughout the season and an area of only 135 acres could be ploughed. The two power-chaff-cutters were also in great demand and chaffed 176 tons of jowar kadbi.

In Nasik, the Taluka Development Associations have six implement depôts and the Department maintains four, for giving out ploughs on hire. The total number of ploughs for this purpose in the departmental depôts was 33 and in those of the Associations, 229. The amount of hire collected was Rs. 266 and Rs. 2,923 respectively. In addition to this, orders for 199 ploughs, of which 75 were from Sinnar alone, were placed with plough-firms and complied with.

In Sinnar taluka, the iron mhot is getting very popular and as many as 60 mhots were ordered out and supplied. 20 spray pumps and 3 thermometers were distributed to owners of grape gardens. The propaganda for Poona gul-pans resulted in getting orders for 8 of them. 12 iron sugarcane crushers were also supplied.

In North Thana, the Persian wheel commonly used for lifting water is being steadily replaced by the Balsad rahat which is more efficient, durable and cheaper to work. 9 new rahats were supplied during the year, by the

Agricultural Overseer. In the same tract, four oil-engines with pumping plants were erected in consultation with that officer.

PESTS AND DISEASES.

Treatment of jowar seed with sulphur dust against smut continued to be popularised. 7,907 packets in Khandesh and 259 in Yeola were distributed to suffice for seed enough to sow 32,664 acres. From the ensuing season, intensive propaganda to cover up the whole jowar tract within a period of 5 years is being planned.

Strychnine baits against jackals in sugarcane plantations and arsenious acid pills against rats were tried with success in the Nasik district. 20 packets of the former were used round about Nasik.

Fish-oil rosin soap is being steadily taken up by irrigation farmers in Nasik district as a remedy against aphis on lucern and thrips on onions. 120 lbs. of this insecticide were supplied in the Nasik sub-division and its use was shown at 13 places in the Malegaon sub-division.

By far the most important plant diseases in this division are (1) the downy mil-dew of grape-vines in Nasik and (2) wilt of betel-vines in North Thana. These are controlled by the same remedy, namely the spraying of Bordeaux mixture. It is estimated that about 25 tons of copper sulphate with an equal quantity of lime were imported into Nasik district for the treatment. To a smaller extent the vines are also attacked by powdery mildew which is kept in check by sulphur dusting. The Ozar-Tambat and Nasik Taluka Development Associations are teaching the gardeners the use of this fungicide and sold 1,100 lbs. of sulphur dust for this purpose. In the betel-vine gardens in Thana, 9 tons each of copper sulphate and lime are estimated to have been used for preparing Bordeaux mixture.

The loss by the attack of hoppers to mango blossom is now possible to be controlled by dusting with sulphur. During the year under report, use of this insecticide was demonstrated for the third season and it is steadily being adopted. 700 trees in North Thana and 216 trees in Pen and Panwel were treated with sulphur dust at a cost of about one rupee per tree. In all, more than two tons of this stuff was used and 11 dust-guns were purchased by owners of mango gardens, of which 5 were in North Thana. It has to be noted that the pest occurred with unusual virulence this year and the effect of the treatment was not so marked as in previous years. Probably, under such conditions, dusting may have to be restored to oftener.

SHOWS, DEMONSTRATIONS AND CLASSES.

A district agricultural and cattle show was held at Nasik under the auspices of the Nasik Panjrapole from 24th to 27th December 1933. The Show was opened by Mr. H. F. Knight, I.C.S., then the Collector of Nasik. There were five sections of (1) Agriculture, (2) Cattle, (3) Farmer's home, (4) Baby and health, and (5) Subsidiary industries. About 600 samples of field produce and 150 cattle from the district were

exhibited. Dr. W. Burns, Director of Agriculture, B. P., had specially come down from Poona to attend the same. He was very much interested in the ploughing competitions arranged on one of the mornings. 29 cultivators took part in these competitions and the first six were awarded prizes. He also presided over the conference of the Taluka Development Associations in the Nasik district held on the Show-grounds. Mrs. Burns gave away prizes in the agricultural section. It is estimated that about 30,000 people must have witnessed the Show. Rao Bahadur R. V. Vandekar, Messrs. Pragji Mavji and J. N. Mankar were the Honorary General Secretaries and thanks are due to them for the strenuous work put in by them to make the show a success. The name of Mr. R. S. Dubhashi, B.Ag., Agricultural Overseer, Nasik, who organised the Agricultural and the Farmer's Home sections deserves special mention for his intelligent and unsparing work.

Agricultural and cattle shows, on moderate scales, were held at Mhasa in Murbad taluka of Thana district and Borivli in the Bombay Suburban district. They were held on 1st to 3rd January and 11th and 12th February 1934 and were visited by about 2,000 and 5,000 people respectively. At both these places, the Bombay Gojivadaya Mandal and the Bombay Gorakshak Mandali helped very much. At Borivli, Mr. Oza, the Manager of the Khatav Trust Property in whose gardens the show was held, rendered valuable help. Agricultural Shows were also held at (1) Trimbak near Nasik on 11th to 13th January visited by about 2,000 people, (2) Vajreswari (Thana district) on 12th to 14th April, visited by about 1,000 people and (3) Badlapur near Kalyan, on 16th and 17th May, visited by about 500 people.

A special mango exhibition was arranged at Dhulia, in Khandesh, for the first time on 17th and 18th June 1934. This was done under the auspices of the Dhulia Taluka Development Association, and was opened by Dr. G. S. Cheema, Horticulturist to Government. As many as 135 select exhibits were received in competition. During the course of the show, methods of mango grafting and treatment of mango pests and diseases were demonstrated.

A horticultural class was organised under the auspices of the Erandol Taluka Development Association at Erandol from 17th to 25th May 1934. It was regularly attended by 55 students. The course consisted of practical training in the morning, lectures in the afternoon and excursions to surrounding typical gardens. The students were examined at the end of the period and awarded certificates. The Association arranged for the lodging and boarding of the students and deserves thanks. Another horticultural class on a smaller scale was held at Bhiwandi in the Thana district in March 1934 and was attended by 15 students. Mr. Jabar Ali of Chembur took personal interest and helped the class very much.

A class in the theory and practice of agriculture was organised by the Agricultural Overseer, Nasik, at Vadner in March 1934. 50 cultivators took advantage of this class and highly appreciated the teachings. Advantage of this occasion was taken to demonstrate methods of preparing

gul of good quality from frosted sugarcane, which was then the chief problem before the people in the surrounding tract.

One of the valuable resources of fertilizers which ought to find its way to the land is the cattle bone. This, at present, goes to bone factories in large towns mostly for export. Thanks to Rao Bahadur Professor D. L. Sahasrabudhe, Agricultural Chemist to Government, a cheap method of pulverising raw bones has now been evolved. A demonstration of this method was given by him at Utran in East Khandesh on the estate of Shet Manekchand Kisondas on 13th and 14th May 1934 and was attended by the staff of the Taluka Development Associations and Agricultural Department. The method consists of smother-burning the bones by arranging them in alternate layers with any combustible refuge, like tur or cotton stalks, tree lopping etc. The burnt bone is then crushed in a motor mill or powdered by hammers. Special propaganda for using the bone especially for orchards will be undertaken.

In addition to these special shows, demonstrations lectures and classes, a very large number of village demonstrations was held all over the division as usual. In Khandesh, as many as 627 demonstrations were held and witnessed by about 37,000 people. Of these 589 were arranged by the Taluka Development Associations. 91 demonstrations pertained to improved varieties of crops, 470 to sulphur dusting against jowar smut, 21 of ploughs and levellers, 2 of power chaff-cutter, 3 of tractor-ploughing, 1 of cane-crushing and gul-making, 18 jamabandi, fair-demonstrations and lectures and 21 magic lantern lectures. Five cattle shows were held at Chalisgaon (for Khillari cattle), Chincholi, Varangaon, Bhusawal and Salsingi (for Nemari cattle). These were attended by nearly 1,700 cultivators.

In Nasik, the district staff held 27 demonstrations of improved varieties of crops, 3 of grading bajri seed, 2 of cotton spacing, 24 of manures and fertilizers on standing crops, 3 of improved implements, 13 of treating crops against pests and diseases, 5 of gul-making, 17 of Poona furnace and 12 jamabandi lectures. Besides these, the Taluka Development Associations held 67 demonstrations.

In Thana and Kolaba, there were demonstrations, 4 of crops, 27 manurial, 10 cultural, 18 of treatment against pests and diseases of crops, 13 of spraying Bordeaux mixture against wilt of betel-vines, 4 of silos and 23 jamabandi and illustrated lectures. Besides these, the Agricultural Overseer, North Thana, gave 30 demonstrations in improved method of grafting and budding, standing crops of improved rice and nagli strains etc. The Taluka Development Associations held 5 demonstrations.

AGRICULTURAL ORGANISATIONS.

With the expected registration of the Nawapur Association, every taluka in Khandesh will have its Taluka Development Association. Appendix " A " summarises the financial condition and extent of service rendered by each of the Associations. It will be evident from that statement that these bodies have really been carrying out very useful work.

Space does not permit comments to be made on the various useful activities of every one of these Associations. Brief mention of some of the outstanding activities of some of these may however be made. Jalgaon and Jamner Associations have cattle breeding farms for Nemari breed and the Shirpur Association has taken back from 1st April 1934 their khillari cattle breeding farm at Sangvi from the Agricultural Department. The Chalisgaon, Bhusawal and Jalgaon Associations organised cattle shows at 5 places. The number of cattle entries were 414 and these were attended by 1,700 people and prizes worth Rs. 195-8-0 were awarded. The Erandol Association organised a horticultural class and the Shahada Association has been doing most systematic work in the spread of wheat, jowar and sann seeds. Shirpur, Amalner and Chalisgaon have rendered useful service for the spread of Banilla cotton. The Bhusaval Association takes special interest in fruit growing and cattle breeding while the Jalgaon Association has made an all round progress. Yawal and Edalabad Associations are making special efforts to come in line with the other Associations.

In the Nasik district, out of 12 talukas, only 5 have their Development Associations. Their main activities, expenditure and receipts have been summarised in Appendix "A". The Satana Association has a membership of 381 and its balance in bank is Rs. 9,190. From the ensuing season, it is going to carry out intensive propaganda work at two centres. This Association has raised special funds for building a store. The Malegaon Association has a membership of 675 and has started concentrated propaganda at one centre. The Kadwa Canal Association has applied for merging itself into Niphad Taluka Development Association for widening its scope of usefulness to the whole of the taluka. It has also consented to do intensive propaganda at Sukena centre. The Yeola Association continues to do useful work with a membership of 420. The Nasik Association shows signs of improvement and has agreed to carry out intensive work at two centres.

New Agricultural Associations have been formed at Kalvan, Chandor and Nandgaon and they have chalked out programmes on the lines of the Development Associations. It is expected that with their help, the spread of agricultural improvements in these talukas will be accelerated

In North Konkan, Thana has three Taluka Development Associations at Palghar, Dahanu and Umbergaon. Their activities have been summarised in Appendix "A". Special mention deserves to be made of the Dahanu Association which organised an Agricultural and Poultry class with 71 students and held a Poultry Show. In Kolaba, there are two Taluka Development Associations at Roha and Mahad. Very little active work is being done by the Mahad Association.

In the Thana district, the various Taluka Local Boards have been showing keen interest and helping the work of spread of agricultural improvements in the district. Besides, at Bassein and Wada, there are Unions of Agriculturists doing similar work.

Mention must also be made of the very useful work turned out by non-credit co-operative societies to further the cause of agricultural

development. There were two crop-protection societies in Khandesh and one more was added to the list at Bhalod during the year. The sale society at Jalgaon and the Chillie sale society at Chinchani, Agricultural requisite society at Mahim, Paddy sale society at Palghar and Chikoo sale society at Bordi, all in the Thana district, have been doing good work.

PLAN OF INTENSIVE PROPAGANDA.

The Taluka Development Associations which are propaganda bodies have a fairly long list of activities, particularly so in Khandesh and Nasik. These bodies have been working for the last six to ten years and time was ripe to take stock of the situation and reorganise the policy of their work. The aim of these Associations is to see that the various agricultural improvements, recommended from time to time, become a routine of agricultural practices of the tract. To achieve this goal, every improvement has to pass through three stages, namely, (1) stage of introduction among the leading and progressive cultivators, (2) stage of wider publicity and convincement, and (3) stage of wide-scale adoption.

On scrutinising the programmes of work of the district staff and the Taluka Development Associations in March 1934, it was found that there were at least not less than half a dozen of agricultural improvements which had passed the first two stages and were ripe for entering the third, namely, the stage of their adoption by every cultivator in the nooks and corners of the tract. What was required was a house to house propaganda with a time-limit to cover the whole of the taluka. These improvements comprise (1) iron ploughs, (2) Banilla cotton, (3) Akola bajri, (4) improved strains of wheat, (5) pure Spanish pea-nut, and (6) sulphur dusting against jowar smut.

The plan of intensive work on these items, is to divide a taluka in five suitable groups, each in charge of a Kamgar. He is to do house to house propaganda work in five villages in the first year and extend the same to additional five villages every year and thus complete his group within a period of five to six years. The Jalgaon and Dhulia Associations will each start work on these lines in four groups simultaneously from the ensuing season. Bhusaval will have three and Erandol, Sindkheda and Chalisgaon one group each. In the Nasik district, Satana and Nasik Associations will begin with two groups and the Malegaon, Yeola and Ozar-Tambat Associations with one each.

ORGANISATION OF MULTIPLICATION AND RENEWAL OF IMPROVED SEEDS.

With such intensive propaganda for spread of improved varieties of crops, the chief difficulty would be the provision of reliable seed to meet the increasing heavy demand. We have only one seed farm in this division, namely, the Jalgaon Farm. The area of this farm too will be reduced to half from the next year due to unavoidable circumstances.

This would naturally further increase our difficulties of seed supply. Attempts are therefore being made to organise private seed farms with the help of well-to-do landlords and charitable institutions such as the Goshalas and Panjrapoles. The ultimate aim is to have one such private seed farm for each taluka. These will be called " Central Seed Farms ". They will grow pure seed supplied by the Agricultural Department, purify the standing crops and preserve the pure produce for distribution to village registered seed growers. The village registered seed grower in his turn will multiply annually seed sufficient for his village and give it to his villagers on exchange system. By this arrangement, purity of seeds will be maintained as there will be a perpetual renewal starting with genuine seed from Government Farm and ending with the village registered seed grower.

Negotiations with three landlords in Khandesh and three in Nasik for starting Central Seed Farms are in progress. One of their demands to undertake such work is that Government should supply all the improved seed for each farm, free of charge every year or pay a subsidy of a couple of rupees per acre. These points will be settled in consultation with the Director of Agriculture. In the Nasik district, negotiations have been made with the Yeola Goshala for a farm of 150 acres for growing Akola bajri, Bansi-palli wheat (strain No. 808) and Maldandi and Dagdi jowar, all on 50 acres each. The Nasik Panjrapole has been approached for a hundred-acre farm to grow 50 acres of Bansi-palli wheat (strain No. 808), 30 acres of Pusa No. 4 wheat and 20 acres of Akola bajri. Sardar N. G. Vinchurkar, B.A., has responded favourably by agreeing to run a farm of 60 acres, thirty of which will be under Bansi-palli wheat and thirty under Akola bajri.

In North Konkan, seed multiplication and renewal has been arranged in the case of improved rice strains on similar lines in 40 villages in each of the talukas of Karjat, Panwel, Bhiwandi and Palghar.

VILLAGE IMPROVEMENT.

The district staff of the Agricultural Department and the Taluka Development Associations are devoting special attention to and helping the Government scheme of Village Improvement, launched during the current year. They are represented on the various village improvement committees and sub-committees and the Associations have also contributed small amounts for this work. For improving the agriculture of the selected villages, the same items as those enumerated under " Plan of Intensive Propaganda " are included. The progress of work will be reported next year.

SPECIAL AGRICULTURAL SCHOOL AT DHULIA.

This is the only special agricultural school in this division and is the second one of its kind in the Presidency. The axe of retrenchment has fallen heavily on this institution and taken away the Assistant Master. As the fate of the school was decided very late, the number of new admissions was only 10. Thus the strength of students in the roll in the

two classes was 22. Of these, 21 students received stipend from the local agricultural committee of Rs. 5 per mensem each, throughout the year. This committee therefore deserves thanks. At the end of the year, the students were examined by Messrs. V. C. Pawte, Inspector of Agricultural Schools, B. P., Manjri Farm and N. V. Bhagwat, Inspector of Agriculture, Dhulia. All boys were declared successful.

Out of 125 students turned out of the school up to now, 42 have taken to private agriculture, 63 have been engaged on propaganda work either with the Taluka Development Associations or the Agricultural Department and the rest of the boys are absorbed in pursuits unconnected with agriculture.

All past students were invited to attend the annual social gathering of the school which was held in the first week of April. The response was encouraging. The contact between members of the staff and students past and present had a salutary effect and benefitted all concerned. A welcome step in forming an " Old boys union " was taken on this occasion.

MISCELLANEOUS.

1. *Warnings of intense cold waves.*—Warnings of intense cold, specially received telegraphically from Indian Meteorological Department, since two years, continued to be disseminated among irrigation farmers, especially in the grape garden zone of the Nasik district. This was very useful during the current year in taking precautionary measures to mitigate the effects of frosts on grapes. A rapid and wider method of circulating these warnings is under contemplation.

2. *Assistance for preparing gul from frosted sugarcane.*—A survey of damage to crops in the Nasik district, consequent on the occurrence of three intense cold spells in January 1934, was made. Sugarcane growers experienced difficulties in Kalvan and Kadwa canal areas in preparing gul of proper consistency and colour. Special help was sent to these places to demonstrate methods of preparing good gul from such canes. This comprised the use of lime water and Saji-khar (mixture of sodium carbonate, sodium bicarbonate and sodium sulphide in crude form obtainable in local bazar) for clarifying the juice at the time of ebulition.

3. *Staff conference.*—A conference of the district staff of Khandesh and Nasik was held at Dhulia in March 1934 to discuss the plan of intensive propaganda and future lines of district work. The members got considerable advantage from the deliberations.

4. *Distinguished visitors.*—His Excellency Sir Frederick Sykes, the Governor of Bombay, was pleased to visit Bassein, Palghar and the Betegaon Cattle Breeding Farm in North Thana. At Bassein, he inspected the research work on Betel-vine wilt disease and the local banana market at the Holi-bazar. At Palghar he saw the Mission Agricultural Bias Class and the Infant Milk Supply Dairy. At the latter institute he performed the opening ceremony of the new Milking-shed.

The sanitary Cattle Dip was announced by him to be open for use during his visit to the Betegaon Cattle Farm.

Diwan Bahadur S. T. Kambli, Minister of Education, paid a visit to Bordi (North Thana) to preside over the 14th Anniversary ceremony of the Gokhale Education Society's High School there. On this occasion the various agricultural improvements advocated by the Department were specially exhibited in a stall which were explained to him.

5. *Agricultural work in the Dangs.*—The agricultural work in the Dangs was transferred to the Agent to the Governor General and Resident, Baroda, from 1st July 1933.

6. *Publicity.*—The members of the staff, all over the division, contributed notes and articles to the various newspapers from time to time and the Shetki and Shetkari magazine. One leaflet on "A way for improving the keeping quality of plantains" was published as a departmental leaflet No. 6 of 1933.

ADMINISTRATION.

Mr. C. S. Patel, L.Ag., held charge of this division till the end of January 1934 when Mr. K. V. Joshi, M.Ag., succeeded him on reversion from his deputation to the Indian Central Cotton Committee. Mr. M. B. Ghatge, B.Ag., Agricultural Overseer, Nasik, was transferred under the Professor of Agricultural Economics, Poona, and Mr. R. S. Dubhashi, B.Ag., took his place. There were no other changes in the staff.

K. V. JOSHI,

Deputy Director of Agriculture,
North Central Division, Nasik.

APPENDIX

Statement showing the information about the Taluka Development Associations in the North Central Division for the year 1933-34.

Serial No.	Name of the Taluka Development Association.	Total actual receipts.	Total actual expenditure.	Government subsidy.	Main activities.							
					Number of plots arranged.	Number of demonstrations arranged.	Quantity of seed sold and distributed.	Number of plants and seedlings distributed.	Quantity of manure and fertilizers sold.	Number of implements sold.	Number of implements kept for hire.	Total hire charges on implements.
1	2	3	4	5	6	7	8	9	10	11	12	13
		Rs.	Rs.	Rs.			Lbs.		Lbs.			Rs.
	Nasik District.											
1	Nasik ..	885	1,169	195	30	15	904	..	1,205	..	7	55
2	Kadwa Canal (Ozar).	2,464	2,226	1,000	23	23	24,166	..	283,865	10	17	570
3	Malegaon ..	3,559	2,072	1,000	49	18	27,084	135	213,848	20	44	693
4	Satana ..	4,158	2,785	1,000	77	6	17,833	100	90,000	30	83	1,175
5	Yeola ..	3,505	3,505	1,000	30	5	5,621	80	4,032	35	7	488
	West Khandesh District.											
6	Dhulia ..	4,027	2,528	1,000	24	33	33,187	500	26,240	14	35	275
7	Sakri ..	3,487	2,038	1,000	36	..	8,000	..	35,000	..	25	166
8	Sindkheda ..	2,468	2,073	1,000	82	40	64,000	5,200	44,960	5	26	183
9	Shahada ..	1,540	1,282	454	17	27	28,668	..	31,251	..	..	7
10	Taloda ..	1,311	1,262	650	49	11	8,800	1,500	8,000	9	..	..
11	Nandurbar ..	1,951	1,647	720	31	24	17,250	..	750	17	..	136
12	Shirpur ..	3,018	1,842	1,000	107	..	7,568	..	84,000	..	..	34
	East Khandesh District.											
13	Jalgaon ..	5,843	4,424	2,000	131	29	81,000	2,735	347,338	25	37	317
14	Bhusawal ..	3,757	2,430	1,000	40	43	3,500	5,000	4,400	30	27	185
15	Raver ..	3,307	3,059	1,000	..	93	4,000	..	11,500	2	22	110
16	Yawal ..	2,188	920	..	22	13	700	..	2,136	19	20	74

APPENDIX—*contd.*

Serial No.	Name of the Taluka Development Association.	Total actual receipts.	Total actual expenditure.	Government subsidy.	Main activities.							
					Number of plots arranged.	Number of demonstrations arranged.	Quantity of seed sold and distributed.	Number of plants and seedlings distributed.	Quantity of manure and fertilizers sold.	Number of implements sold.	Number of implements kept for hire.	Total hire charges on implements.
1	2	3	4	5	6	7	8	9	10	11	12	13
	East Khandesh District—contd.	Rs.	Rs.	Rs.			Lbs.		Lbs.			Rs.
17	Edlabad ..	1,200	1,015	543	38	19	200	300	600	..	..	91
18	Amalner ..	2,001	1,020	734	25	40	48,845	..	..	..	23	42
19	Chalisgaon ..	4,105	2,630	1,000	53	54	25,400	..	16,160	36	35	380
20	Chopda ..	2,458	1,907	654	26	19	9,604	75	8,005	17	17	163
21	Erandol ..	2,227	1,292	1,000	9	90	9	150	3,008	..	..	48
22	Pachora ..	2,111	2,394	592	148	21	3,820	1,566	33,208	..	20	271
23	Parola ..	1,743	608	..	14	33	14,850	545	4,700	11	9	95
24	Jamner* ..	..	..	..	..	..	..	..	..	..	..	..
	Thana District.											
25	Dahanu ..	401	655	151	4	..	7,630	..	6,720	..	..	..
26	Palghar ..	1,221	1,047	347	13	3	2,100	..	8,240	..	..	..
27	Umbergaon ..	592	166	143	..	1	1,400	..	2,000	..	..	..
	Kolaba District.											
28	Mahad ..	5	153	..	..	..	1,610	..	..	..	..	..
29	Roha ..	300	512	201	14	1	910	..	1,568	..	..	..

* Information not received.

ANNUAL PROGRAMME OF WORK, 1934-35.

North Central Division.

RESEARCH.

Jalgaon Farm—

(1) Cotton Breeding for wilt resistance.

(2) Jowar Breeding.

(3) Selection work in groundnut.

(4) Purification on individual lines of S. 9-A Castor.

(5) Manurial experiments on cotton.

(6) Cultural experiments on Jowar.

(7) Experiment of grading of jowar seed.

(8) Manurial experiments on wheat.

Rice Research Station, Karjat—

(1) Field experiments on the time and quantity of application of sulphate of ammonia to the rice crop.

(2) Pot trials of oil cake manuring to rice, singly and in combination, with sulphate of ammonia on the basis of nitrogen required in different doses.

(3) Estimation of the loss of lime and organic matter from the soil and amelioration of the proteid contents of rice depleted due to the application of sulphate of ammonia as manure.

(4) Investigation into the effects of oil cake manuring on soil, grain and straw.

(5) Varietal study of proteid contents of important rices of Thana and Kolaba Districts.

AGRICULTURAL SERVICE AND PROPAGANDA.

(*A*) *Crops.*—(1) Extension of Banilla cotton seed. (2) Distribution of pure groundnut seed of Spanish pea-nut. (3) Introduction and multiplication of improved wheat strain Nos. 168, 224 in Khandesh and 808 in Nasik. (4) Extension of J. 213 sugarcane variety in irrigated tract of Sakri taluka in West Khandesh. (5) Introduction and multiplication of new sugarcane varieties E.K. 28 and C.O. 290. (6) Multiplication of improved rice strains Nos. 42, 226 and 540 in Thana and Kolaba districts. (7) Extension of Maldandi jowar in Shahada taluka. (8) Trial of Dagdi, Maldandi and Aispuri jowar in Nasik district. (9) Spread of Akola bajri on extensive scale in Nasik and Khandesh districts.

(*B*) *Trial of new crops.*—(1) Soya beans. (2) Pusa gram. (3) Nipani and P. 28 tobacco. (4) New vegetable and fodder crops. (5) Strains of nagli Nos. M.M. 1 and 2.

(*C*) *Manures, Fertilizers and Implements.*—(1) Popularising the use of concentrated manures and fertilizers to irrigated crops and Sann green manure to wheat in Tapti Valley. (2) Popularising artificial manures for vegetable crops. (3) Working of tractor and Power Chaff-cutters in Khandesh. (4) Stone Roller for jowar threshing. (5) Local plough with sheet arrangement for earthing up sugarcane in Sakri taluka. (6) Balsad Rahat. (7) Wheat thresher, groundnut harvester and winnowing fan.

(*D*) *Pests and Diseases.*—(1) Propaganda on extensive scale of sulphur dusting against jowar smut in Khandesh and Nasik. (2) Sulphur dusting against hoppers on mangoes in Thana and Kolaba Districts. (3) Popularising Bordeaux mixture against wilt on betel-vines in Bassein and Mahim tract of Thana district.

(*E*) *Horticulture.*—(1) Encouraging starting of nurseries. (2) Budding of seedless and Meharun bôr varieties. (3) Extension of fruit cultivation in Khandesh, North Nasik and Thana Districts.

(*F*) *Village Improvement Work.*—To advocate the following improvements through the Village Improvement Committees :—

(1) Proper storage of Farm Yard Manure. (2) Poudrette making by trench latrines. (3) Compost making. (4) Green manuring of wheat. (5) Tree planting. (6) Discouraging Cowdung burning. (7) Use of bone manure. (8) Controlling soil erosion. (9) Drainage. (10) Popularising dry farming methods. (11) Use of iron ploughs. (12) Supply of improved seeds. (13) Measures against pests and diseases of plants such as jowar smut, Aphis and thirps, mango hoppers, etc. (14) Starting agricultural village organisation like Famine relief grain and fodder fund, grain Bank, etc. (15) Chaffing of fodder. (16) Consolidation of holdings. (17) Inculcating thrift, self-help, mutual aid and business outlook in agriculture.

(*G*) *Miscellaneous.*—(1) Supervision and guidance of the Taluka Development Associations. (2) Organisation of a Regulated Cotton Market at Amalner. (3) Organisation for multiplication and renewal of improved seeds by encouraging people to start " Private Seed Farms ". (4) Investigation of the possibilities of developing the Patalganga and Ulhas river valleys in Kolaba district.

K. V. JOSHI,

Deputy Director of Agriculture,
North Central Division, Nasik.

Nasik, 6th August 1934.

APPENDIX D.

Summary of Work done under the Deputy Director of Agriculture, South Central Division, Poona, for the Year 1933-34.

Staff.

Mr. V. V. Gadgil continued to hold the charge of the Division throughout the year under report. The Deputy Director of Agriculture, South Central Division, continues to be the nominee of Government to represent agriculture on the Local Advisory Committee of the G. I. P. Rly., Bombay. The Deputy Director of Agriculture also continues to be a Member of the Irrigation Conference.

The changes in the staff were as under :—

In July 1933, Mr. R. K. Kulkarni, the Superintendent, Mohol Farm, was transferred for work to the section of the Crop Botanist to Government, Bombay, Karjat, and in his place Mr. D. B. Barve, B.Ag., was posted to Mohol Farm to work as Superintendent.

In September 1933, Mr. C. A. Borudey, the Superintendent, Kopargaon Farm, proceeded on leave on average pay for two months and was subsequently transferred in foreign service on deputation from 11th November 1933 to work in the Sugar Factory at Akluj (District Sholapur) for one year in the first instance. In place of Mr. C. A. Borudey, Mr. S. B. Jadhav, the District Agricultural Overseer, Malsiras, was posted for work at Kopergaon Farm as Superintendent of the Farm, his place being taken by Mr. B. N. Bhandarkar, District Agricultural Overseer, Baramati, an equally senior and experienced Graduate Assistant. In the place of Mr. B. N. Bhandarkar, Mr. B. G. Oka, the District Agricultural Overseer, Belapur Road, was posted to work as District Agricultural Overseer, Baramati, Mr. Oka's place being taken up by Mr. D. H. Joshi, B.Ag., who was relieved from the Visapur Canals.

Mr. R. B. Shinde, B.Ag., District Agricultural Overseer, Satara, who was on long leave on medical certificate from September 1932, joined duty in December 1933, and was posted for work as District Agricultural Overseer, Shrigonda for Visapur Canals, thus relieving Mr. D. H. Joshi to join at Belapur Road as mentioned above.

In December 1933, Mr. H. C. Patil, District Agricultural Overseer, Satara, proceeded on two months' leave and Mr. S. G. Futane, B.Ag., acted for him.

In the middle of April 1934, Mr. S. K. Patwardhan, B.Ag., the Superintendent, Ratnagiri Farm, was transferred to Poona to work under the Horticulturist to Government, B. P., Poona, and in his place Mr. V. H. Kulkarni, M.Ag., the Superintendent, Modi-Bag, was transferred to Ratnagiri to work as Superintendent, Ratnagiri Farm.

Owing to further extension by two years from 1st January 1934 of the period of deputation of Mr. G. L. Patil in foreign service under the Kolhapur State, Mr. S. G. Futane, B.Ag., has been continued to work

in this Division and is posted for work as District Agricultural Overseer, Pandharpur, under the Inspector of Agriculture, Sholapur.

The dry tracts of Ahmednagar and Sholapur Districts were receiving full attention as per recommendation 73, Chapter IV of the report of Royal Commission on Agriculture in India, by the appointment of temporary staff, since 1929. This work, however, had to be curtailed owing to the temporary staff, viz. four Kamgars having been disbanded with effect from 1st December 1933, for want of funds. Similarly, two posts of temporary Kamgars made available to develop the progaganda work on Nira Right Bank Canal, since 1927, were discontinued by making available two Kamgars by re-adjustment of the staff.

The Deputy Director of Agriculture attended the Sugar Conference held at Simla as a representative of the Bombay Government in July 1933 in which several important matters such as zoning, licensing of sugar factories, fixing minimum price for cane, etc. were discussed. In this Conference the views of the Bombay Agricultural Department were clearly explained and its result is seen in passing the Sugarcane Protection Act of 1934 by the Legislative Assembly.

Lines of Work.

The work of this Division is summarised under the following heads :—

(I) Research.
(II) Propaganda.
(III) Agricultural Organization—
  (*a*) Taluka Development Associations.
  (*b*) Non-credit Societies.
(IV) Agricultural Services.
(V) Miscellaneous.

Section I.

Research.

Kopargaon Farm.

Season.—Total rainfall during the year was 21·46″ against the average of 19·52″ for the past 19 years. The yields of crops were in general low due to uneven distribution of rainfall and the cold wave in the month of January 1934. The prices of gul and grains were also low.

The following experiments were conducted on this Farm :—

(1) Trial of cane varieties.
(2) Nitrogenous requirements of cane.
(3) Improved method of planting cane versus Local Method.
(4) Diversification of cane farming.
(5) Adsali cane cultivation.
(6) Miscellaneous experiments :—
  (*a*) Trial of sunflower.
  (*b*) Trial of growing Castor crop.
  (*c*) Banilla cotton.

(1) *Trial of cane varieties.*—The following varieties were tried and their yields are as below :—

Plant Cane.

(Yield per acre).

Name of variety.	Weight of cane in lbs.	Weight of gul in lbs.	Extraction.	Brix.	Gul to cane.	Period of harvesting.
1	2	3	4	5	6	7
Stripped D. 109	75,918	8,213	66·25	18·7	10·65	12·7
E.K. 28	65,963	8,482	65·37	21·8	12·8	12·4
P.O.J. 2878	52,354	6,368	64·87	22·27	12·1	12·0
Pundia	57,806	6,760	70·5	18·57	11·7	12·13

Ratoon Cane.

(Yield per acre).

Name of variety.	Weight of cane in lbs.	Weight of gul in lbs.	Extraction.	Brix.	Gul to cane.	Period of harvesting.
1	2	3	4	5	6	7
Stripped D. 109	59,895	6,077	65·5	18·29	10·1	11·29
E. K. 28	69,877	8,827	68·12	21·2	12·65	11·20
P.O.J. 2878	79,532	9,677	64·12	21·82	11·5	11·18
Pundia	54,250	6,382	68·0	19·69	11·8	11·1

The general yields of sugarcane during the year under report were low due to uneven distribution of rainfall and poor soil. In the case of Plant Cane, E.K. 28 has given highest yield and P.O.J. 2878 has given lowest yield of gul per acre, while in the case of Ratoon Cane, P.O.J. 2878 has given highest yield and stripped D. 109 has given lowest yield of gul per acre. E.K. 28 has done well as Ratoon cane also. It is observed that E.K. 28 does not sprout well if it is harvested in December or January. The ratoon sprouts alright, if it is harvested in March, but it cannot be kept so long if it arrows in November. P.O.J. 2878 is a little harder than E.K. 28 as will be seen from the percentage of extraction but it has given the highest brix reading in plant as well as Ratoon cane. The stand of the ratoon of P.O.J. 2878 was very attractive and the cultivators who visited this Farm were well impressed. Three more varieties, viz. Co. 290, Co. 352 and Co. 356 are brought for trial and their results will be available next year.

(2) *Nitrogenous requirements of cane.*—This is the fifth year of this experiment tried on Local Pundia cane. The following table shows the average yields for the last five years for plant cane and for the last four years for Ratoon cane :—

Treatment.	Plant.		Ratoon.	
	Weight of		Weight of	
	Cane.	Gul.	Cane.	Gul.
	Lbs.	Lbs.	Lbs.	Lbs.
100 lbs. N.	83,307	10,791	53,472	6,643
150 lbs. N.	89,926	11,432	61,619	7,545
200 lbs. N.	93,022	11,929	62,081	7,533

The results of the year under report show that there is a progressive increase in the yield of plant and Ratoon cane with the increase of Nitrogen per acre. The average figures also show the same thing but there is not much difference in the yields of cane and gul of Ratoon cane top-dressed with 150 and 200 lbs. Nitrogen per acre. The yields of Ratoon cane in the year 1930–31 only were much higher in the case of 150 lbs. Nitrogen plot than in the plot treated with 200 lbs. N. per acre ; otherwise the results are in favour of increased doses. The variations in the nature of soil have a great bearing on the results of plots. The economic value of the dose may be in favour of 150 lbs. N. per acre when the prices of gul are low but this experiment will require further trials for several years, to come to any definite conclusions.

(3) *Improved method of planting cane versus Local Method.*—The trial of improved method (modified Manjri Farm Method) versus Local Method of planting cane was continued.

The yields of Local method are higher than those of Improved Method but cost of cultivation of Local Method is much higher than that of Improved Method and so the improved method is more economic. The prices of gul were as low as Rs. 11-12-0 per palla and so there is loss in both the plots as shown in the following statement :—

Plant cane.	Yield per acre in lbs.	Cost of cultivation.	Net profit or loss.	Ratoon cane.	Yield per acre in lbs.	Cost of cultivation.	Net profit or loss.
		Rs.	Rs.			Rs.	Rs.
Improved method.	8,591	484	— 67	Improved method.	5,776	288	— 37
Local method.	10,565	648	— 136	Local method.	6,995	385	— 44

(4) *Diversification in cane farming.*—The following table shows the net profit or loss on the main crop of sugarcane and other rotational crops in each series :—

I Series.

Crop.	Yield per acre in lbs.	Value.	Cost of cultivation.	Net profit.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Sann	11,059	390 0 0	*450 0 0	— 60 0 0
Cane	8,009			
Ratoon	4,700	227 0 0	260 0 0	— 33 0 0
Bajri—				
Grain	500	17 0 9	52 0 0	— 33 8 6
Fodder ..	1,440	1 6 9		
Gram	628	19 0 0	25 0 0	— 6 0 0
Tobacco : ..	No crop due to failure of seedlings caused by excessive rainfall and attack of insects.			

* This includes also cost of sann green manuring.

II Series.

Crop.	Yield per acre in lbs.	Value.	Cost of cultivation.	Net profit.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Sann	11,059	375 0 0	433 0 0*	— 58 0 0
Cane	7,708			
Ratoon	2,868	139 0 0	242 0 0	— 103 0 0
Cotton	988	80 0 0	42 0 0	+ 38 0 0
Bajri—				
Grain	836	29 0 0	61 0 0	— 27 0 0
Fodder ..	1,820	5 0 0		
Gram	504	16 0 0	28 0 0	— 12 0 0

* This includes cost of sann green manure.

There is a loss in all the crops in the above two series except in cotton. It is chiefly due to low prices and poor yields of sugarcane.

(5) *Adsali cane cultivation.*—The following statement shows the results of adsali cane planted on 1st July 1932 and harvested periodically :—

Dates of periodical crushing.	Yields of adsali crop per acre.			
	Weight of cane in lbs.	Weight of gul in lbs.	Brix.	Gul to cane.
17th October 1933 ..	106,112	9,968	17·08	9·4
16th November 1933 ..	116,464	10,784	16·24	9·25
15th December 1933 ..	113,936	10,672	16·98	9·3
16th December 1933 ..	109,872	12,008	16·98	10·2

Note.—The whole of the remaining crop was crushed from 16th December onwards after the 3rd test taken on 15th December 1933.

The crop was seriously damaged by field rats and so the results of this periodical harvesting of Pundia cane were vitiated to a certain extent. The crop had tremendously lodged and the rats had damaged the canes at the roots, internodes and also at the top. The two varieties, viz., P.O.J. 2878 and E.K. 28 were newly tried as Adsali canes, the former being quite erect and the latter also being more or less erect. These were damaged by rats to a very small extent. Their results are as follows :—

Yields per acre.

Name of variety.	Weight of cane.	Weight of gul.	Brix.	Gul to cane.
	Lbs.	Lbs.		
E.K. 28	119,648	13,744	20·25	11·45
P.O.J. 2878	157,944	17,664	20·24	11·19

P.O.J. 2878 has given the highest yield of gul per acre and it seems to be a very promising cane to grow as Adsali crop. This is the first trial of these varieties and it will be continued for a few years more to arrive at definite conclusions. These varieties were harvested in the last week of December 1933. Ratoon of Adsali cane has not been tried by anybody uptil now on the Deccan canals and so the ratoon of these two varieties is kept for trial as the yield of P.O.J. 2878 was exceptionally high and it had also sprouted very profusely after harvest. Results of these trials will be available for the next year's report.

(6) *Miscellaneous experiments*: (*a*) *Trial of Sunflower.*—This was tried as a fodder crop in a small area of 10 gunthas only. The crop was ready for feeding within 2½ months from the date of sowing. It supplies large quantity of green fodder within a short period but the bullocks of this Farm did not relish it as the plants have tiny spears and give repugnant smell. Half of the

crop was cut for fodder when the seed was in the milk stage and it gave 24,750 lbs. green fodder per acre. The cost of cultivation of this crop amounted to Rs. 104 per acre but the cost of seed alone was Rs. 48. The crop was kept for seeding in 5 gunthas and it yielded 824 lbs. seed per acre. It is said that this seed is sold at As. 12 to Re. 1 per lb. The value of the above yield amounts to Rs. 618 at As. 12 per lb. and so the net profit per acre comes to Rs. 514, if there is a demand for it. It is possible to obtain even more yield if the crop is manured.

(*b*) *Trial of growing castor crop.*—The following statement shows the results of this crop :—

Name of crop.	Area in acres.	Yield per acre in lbs.	Value.	Cost of cultivation in Rs.	Profit.
			Rs. a. p.	Rs. a. p.	Rs. a. p.
Castor seed ..	1	774	33 13 9	49 1 6	−15 3 9

The seed was brought from Nandurbar (Khandesh) and tried in 15 gunthas. The height of the crop was not more than 4 feet. This was the first year of trial and the experience now shows that it requires thick sowing at the distance of 2 to 3 feet to get more yield. Further trials of this crop will be necessary to prove its economic value.

(3) *Banilla cotton.*—No other variety except Banilla cotton was grown on the Farm during the year under report. It was sown on the ridges in May after Adsali cane crop. It will be seen from the following statement that the crop sown earlier has given more yield :—

Banilla cotton.	Area.	Yield per acre in lbs.	Value.	Cost.	Profit.
	Acres.		Rs. a. p.	Rs. a. p.	Rs. a. p.
Early sown (sown on 8th May 1933) ..	1	1,316	109 10 9	54 1 3	55 9 6
Late sown (sown on 15th May 1933) ..	1	1,249	104 1 0	54 1 3	49 15 9

Mohol Farm.

Season.—Unlike last two years, the season seems to have changed to the normal conditions of this tract. This will be clear from the following comparative statement of rainfall figures :—

Average rainfall in 1927 to 1930.	Rainfall in 1931–32.	Rainfall in 1932–33.	Rainfall in 1933–34.
23·48″	37·85″	33·69″	22·54″

There was practically very little rain in the kharif season and most of the crops like cotton and groundnut suffered very heavily. Heavy rain was received in September 1933 and the sowing of rabi jowar was started in October 1933. The November rains were favourable to the rabi crops. But the sudden cold weather in January 1934 produced sugary disease (Chikata) and the crop came to maturity earlier. On the whole, the season was almost normal for rabi season. The minimum and maximum yields of jowar on this Farm of 35 acres were 264 lbs. and 695 lbs. of grain per acre.

The following experiments were conducted on the Farm :—

(1) Dry farming experiments ;
(2) Proper time of sowing jowar ;
(3) Interculturing of jowar ;
(4) Manurial experiments on jowar ;
(5) Jowar breeding.

(1) *Dry farming experiments.*—These experiments were in continuation of last year's experiments. The two treatments compared in the dry farming method, viz., (1) ploughing and (2) harrowing and sowing the plots with 18" seed drill were tried against the cultivators' method, viz., sowing with 12" drill. The test had four replications and each of the plots was ½ acre. The results are given below :—

	Yields per acre in lbs.		
	Ploughing.	Harrowing.	Cultivators.
Grain	230	240	196
Fodder	689	719	826

The ploughed and harrowed plots have given higher yield of grain while the cultivators' method has produced more fodder on account of high seed rate.

(2) *Proper time of sowing jowar.*—A test was laid out wherein Maldandi seed strain No. 47-3 was sown on four different dates during the sowing season, and replicated four times, on one guntha plots each. The results are given below :—

	Average yield of one guntha plot in *lbs.*			
Dates	20th September 1933.	27th September 1933.	4th October 1933.	11th October 1933.
Grain	16	21	17	8
Fodder	41	47	44	29

The crop sown on the 27th September produced higher outturn. The experiment must be repeated to draw conclusive results. This result confirms the experience of the last year.

(3) *Interculturing of jowar.*—This experiment was conducted to confirm the results of last year. The treatments under trial were :—

(1) Interculture with hand hoe and bullock hoe ;

(2) Ploughing with light plough between rows at the time when the plants put forth ear heads ;

(3) No interculture.

Each treatment was replicated five times on plots of two gunthas each. The results are tabulated below :—

	Yield per acre in lbs.		
	Interculture with hand hoe.	Ploughing.	No interculture.
Grain	568	508	540
Fodder	1,608	1,548	1,640

(4) *Manurial experiments.*—An experiment to study the comparative effect of Bone-meal, Farm Yard Manure on washed area of the farm was laid out. The experiment was laid out in 4 randomised blocks ; each plot within the block was 2 gunthas. Bone-meal was given at the rate of 224 lbs. per acre and Farm Yard Manure 10 cart-loads per acre. The results are given below :—

	Yield per acre in lbs.		
	Bone-meal.	F. Y. Manure.	No manure.
Grain	252	304	264
Fodder	1,072	1,096	1,012

No conclusions can be drawn from one year's results.

(5) *Jowar breeding.*—Selection work in jowar culture is in progress. The following characters are being critically studied :—

(1) Height of plant ;
(2) Length of ear-head ;
(3) Diameter of ear-head ;
(4) Length of peduncle ;
(5) Thickness of stem ;
(6) Earliness in flowering ;
(7) Grain size.

Yield trial.—Yield test with five promising strains against Local and graded seed was laid out on seven blocks in which plot arrangement was randomised. The results are given below :—

	Yield per acre in lbs.						
Strain	47–3	35–1	31–2	N–11	M–9	Graded	Local
Grain	610·8	525·6	538·4	568·4	651·2	597·2	638·0
Fodder	2,154	1,872	1,588	2,000	2,176	2,016	2,364

The season was more favourable to local which contains a mixture of early and late strains.

Yield test with Dagadi selections.—Yield test of Dagadi strains, viz., ND–8, ND–15 and Mirajgaon BD–24, BD–29, BD–34 with Dagdi Locals from Bijapur and Nagar was taken on the Mohol Farm in four randomised blocks. The plots within the blocks were each of one guntha and the seed was drilled at the rate of 6 lbs. per acre. The results are as below :—

	Yield per acre in lbs.							
Strain ..	ND–Local	ND–8	ND–15	Miraj-gaon	BD–Local	BD–29	BD–24	BD–34
Grain ..	690	600	630	570	660	570	620	740
Fodder ..	3,910	2,060	3,420	2,880	2,600	2,450	3,680	3,100

Ratnagiri Farm.

Season.—The total rainfall recorded on the Ratnagiri Farm during the year was 117·92". The anti-monsoon showers were received from 13th of May and regular monsoon broke out by the end of May. Owing to excessive rains just after sowing, the germination of seeds was defective. In the month of July, there was poor rain and in some cases transplanting had to be stopped till about the 10th of July when rains were favourable. The rainfall was of peculiar nature getting excessive on one occasion with a long break afterwards. In short, the season of the year under report was not favourable for the rice crop in general.

The work of this farm can be divided under the following sub-heads :—

(1) Rice breeding and selections at Ratnagiri ;
(2) Nagli work at Hatkhamba sub-station ;
(3) Pine-apple work.

(1) *Rice breeding and selections.*—Multiplication of the improved early strains of rice, Patni No. 6 and Kudai No. 25, was done on the farm as usual. Patni seed amounting to 800 lbs. and Kudai amounting to 300 lbs. was distributed among cultivators in the district. The quantities reserved for distribution of Patni and Kudai for the next year are 1,850 lbs. and 230 lbs. respectively.

The intermediate strains of Panvel No. 61 and Waksal No. 207 were again compared with each other by A B B A method. Waksal No. 207 showed superiority over Panvel No. 61 by giving 45·8 per cent. increase in yield but the results cannot be taken as conclusive as the Panvel strain was subject to the attack of " stem-borer " to the extent of about 22 per cent. during the season. The experiment will be repeated next year. During the year under report, 1,700 lbs. of Panvel and 2,160 lbs. of Waksal were distributed in the district, while 1,180 lbs. of seed of Panvel and 1,475 lbs. seed of Waksal have been reserved for distribution next year. Bhadas No. 79 repeatedly showed significant increase over local Bhadas. This year the increase is by 30·8 per cent. So this strain No. 79 will be sent in the district as improved strain of Bhadas and grown on the farm for the multiplication of its seed.

As regards late strains, the Sakharpa plot was abandoned due to retrenchment. This year, the trials of late Varangal strain No. 420, 448 and 487 suffered badly owing to the severe attack of stem-borer. The trials were undertaken on the Ratnagiri Farm and as expected the stem-borer worked havoc by damaging the crop to the extent of 40 per cent. It is contemplated to shift the place for the trial of these strains to Chiplun next year so as to arrive at conclusive results.

As regards fine Waksal selections, the seven selections Nos. 1, 3, 5, 22, 25, 27 and 29 were grown intensively on the Ratnagiri Farm with alternative check. Of these, Nos. 1, 3 and 7 have shown superiority over the rest. These will be grown next year by Fishers' method to mark out the best along with the Varangal strains at Chiplun. All the seven strains however will be grown on intensive scale.

Regarding " cross " between Patni No. 6 and Kolamba 79, out of the 20 individual plants separated out with the desired character, five samples Nos. 4/1, 4/7, 16/3, 17/23 and 17/58 have been further selected for the pest-resisting and high-yielding characters. These will be grown next year intensively for final selection.

Manurial trials on paddy.—This was the third and final year of the trial of Nicifos to paddy crop in the same plots. The trial was made on the strain Patni No. 6 as done in the past two years. The superiority of Nicifos is now confirmed as the plot treated with it has successively given increased yield for three years. The increased per cent. has been 14, 36 and 37·6 for the three years respectively.

(2) *Nagli work at Hatkhamba Sub-station.*—The multiplication of the improved Nagli strains, A16, B11, E31, E44, B62 and E82, was done on the Hatkhamba Farm as usual. About 29 gunthas of land was sublet to the cultivators for the multiplication of the improved seed of B11 and

E31. All due care was taken in the cultivators' fields to maintain the strains pure.

Manurial experiments on Nagli.—The repeated trials for the last three years of the three different kinds of manures, Nicifos, Fishmanure and mixture of Sulphate of Ammonia and Bonemeal, on the two Nagli strains A16 and B11 conclusively proved the superiority of the mixture of Bonemeal and Sulphate of Ammonia (80 lbs. of Sulphate of Ammonia and 120 lbs. Bonemeal) over the rest. This mixture will now be recommended to the public as a suitable and economic manure for Nagli.

(3) *Pine-apple work.*—Ratnagiri climate has been found to be very congenial for the cultivation of the pine-apples. The area under pine-apple has been extended from 8 gunthas to 35 gunthas during the year under report. The varieties Que and Queen have been now very familiar with the general public of this district. Fruits worth Rs. 90 were sold during the year. It is hoped to extend the area to two acres during the next year. The weight of each fruit varied from 6 to 8 lbs.

Section II.

PROPAGANDA.

The principal items of propaganda are given below :—

(1) *Treatment of Jowar seed against smut.*—The work of mixing Sulphur dust in Jowar seed was conducted more vigorously in all the Deccan Districts. The following number of packets were distributed during the year :—

Name of the District.	Number of Packets distributed.	Area under treated Jowar.
		Acres.
(1) Poona	500	6,000
(2) Ahmednagar	1,000	12,000
(3) Satara	5,260	31,560
(4) Sholapur	2,589	31,000
(5) Canal area	1,557	20,000
Total ..	11,106	100,560

During this year, the attack of smut was rather very severe on account of late rains ; but, it is gratifying to note that the treated seed had hardly produced any smutted ear-head when the un-treated seed had produced from 5 to 18 per cent. ear-heads of smut.

(2) *Introduction of new crops and varieties.*—As mentioned in the last year's report, efforts were made to extend the cultivation of new sugar-cane varieties such as E.K. 28, P.O.J. 2878, Co. 290, H.M. 89 etc. as these varieties are superior to Pundia in respect of hardiness, more sucrose content and earliness. During the year, the following numbers

of fresh sets were distributed to the cane-growers of the Deccan Canals at concession rates:—

Name of Variety.	No. of Sets distributed.
E.K. 28	550,750
P.O.J. 2878	250,500
Co. 290	20,000
H.M. 89	5,000

Besides these, several sugar factories were supplied with a large number of sets of these varieties. The area under these varieties is given below :—

Kind of Variety.	Acreage on Deccan Canals.	
	Planted by Irrigators.	Planted by Sugar Factories.
(1) E.K. 28	768	2,250
(2) P.O.J. 2878	492	1,250
(3) Co. 290	84	375
(4) H.M. 89	8	....

The distribution of these varieties is going on for the last three years and the average yields of these varieties during the last three years are tabulated below :—

Kind of Variety.	Yield in lbs. of Gul per acre.		
	1931–32.	1932–33.	1933–34.
(1) E.K. 28	14,150	13,578	13,000
(2) P.O.J. 2878	....	13,300	14,500
(3) Co. 290	....	12,375	12,500
(4) H.M. 89	12,750	12,400	13,000
(5) Pundia	11,020	10,032	11,000

The Sorghum cane hybrids, viz. Co. 351 to Co. 357, have been planted at Belwandi, but they do not seem to mature earlier than 8 months.

(3) *Introduction of Banilla cotton.*—The advantages of Banilla cotton are mentioned on page 77 of last year's report and the work of extending its cultivation is further going on. During the year under report, the average yield of Banilla cotton in sugarcane block was 1,070 lbs. as against 950 lbs. of Kapas from N.R. cotton per acre. During this year, sufficient seed of Banilla cotton was not available, hence, only 12,000 lbs. of Banilla cotton seed was distributed on the Deccan Canals.

In the dry tracts of Ahmednagar, Sholapur and Poona about 20,750 lbs. of N.R. cotton was distributed to satisfy the demand of the public. Comparative trials of Banilla and N.R. cotton conducted in the dry tracts show that Banilla cotton produces 10 to 15 per cent. more yield than N.R. and fetches 5 to 10 rupees more per Khandi of 500 lbs.

During the year, a scheme of multiplying the Banilla cotton at the Kopergaon Farm for distributing seed on the Deccan Canals has been sanctioned by the Indian Central Cotton Committee at a cost of Rs. 23,800 for a period of five years. This scheme has now been brought into action and Banilla cotton has been sown on an area of more than 30 acres on the Kopergaon Farm. It is expected that this scheme will solve the question of Banilla cotton seed supply for all the Deccan Canals as well as for the part of the dry tract.

Experiments with artificial manures on cotton were further conducted and the results are given below :—

Treatment per acre.	Yield of Kapas per acre.
(In perennial block after sugarcane.)	
(1) 25 lbs. of N. from Sulphate of Ammonia ..	1,259
(2) 25 lbs. of N. from Nitrate of Soda	1,348
(3) Control (no manure)	1,026
(In eight months' block.)	
(1) 20 lbs. of N. in Sulphate of Ammonia and 15 lbs. of N. in Oil-cake	815
(2) 20 lbs. of N. in Nitrate of Soda and 15 lbs. of N. in Oil-cake	852
(3) Control (no manure)	657

The superiority of Nitrate of Soda over Sulphate of Ammonia and the necessity of supplying artificials to cotton crop even after sugarcane have been well brought out by the above results.

(4) *Spread of groundnut.*—The cultivation of Spanish peanut is gradually extending on the Canals as well as in the dry tract of Poona and Ahmednagar Districts ; but, this year was a very bad year for groundnut, as the prices had gone abnormally low. About 20,000 lbs. of Spanish peanut was distributed in this Division. The yields in the irrigated tract varied from 1,100 to 1,450 lbs. while in the dry tract it ranged from 600 to 900 lbs. per acre.

The application of 200 lbs. of Superphosphate was continued during this year and the results are given below :—

Treatment.	Yield per acre.
	lbs.
(1) 200 lbs. of Superphosphate	1,450
(2) No manure	1,120

(5) *Akola Bajri.*—The introduction of Akola Bajri was again continued and about 8,600 lbs. of bajri seed was distributed to the cultivators. Comparative trials of Local *vs.* Akola Bajri were made which resulted in the increased yield of Akola Bajri varying from 20 to 50 per cent. over the local one.

At Virgaon, which is the centre of Akola Bajri, trials of bajri strains selected by the Crop Botanist to Government, were made and the results are given below:—

Stain No.	Yield of grain per acre.
No. 52	340
No. 37	334
No. 59	361
Local	450
Akola Bajri	439

(6) *Pusa Wheat.*—The Pusa wheat is now gaining confidence amongst the cultivators and its area is rapidly increasing, both on the Deccan Canals and in the dry tract. In the Poona District, the area under this wheat is more than 2,000 acres. Comparative trials of local and Pusa wheat were made and the results are given below:—

Name of district.	Place of the trial.	Name of variety.	Yield per acre in lbs.	
(1) *Sholapur* ..	Pandharpur ..	Pusa No. 4 ..	300	Dry.
		Local wheat ..	175	
	Godjagaon ..	Pusa No. 4 ..	305	Dry.
		Local wheat ..	190	
	Barsi ..	Pusa No. 4 ..	675	Irrigated.
		Local wheat ..	Failure	
	Arjunsonda ..	Pusa No. 4 ..	800	do.
		Local wheat ..	Failure	
(2) *Nagar* ..	Karjat ..	Pusa No. 4 ..	909	do.
		Local Baxi ..	831	
	Ahmednagar ..	Pusa No. 4 ..	1,128	do.
		Local Baxi ..	792	
	Shrigonda ..	Pusa No. 4 ..	630	do.
		Local Baxi ..	500	
(3) *Canal Area* ..	....	Pusa No. 4 ..	950	do.
		Baxi ..	635	

(7) *Tobacco.*—In the Ratnagiri District, Nadiad No. 28 and Adcock varieties of Tobacco were tried as semi-kharif crops without irrigation at 16 centres and the results are very encouraging. The product was appreciated by the Tobacco Breeder, Nadiad. On the creep side, the Tobacco crop has yielded 1,600 lbs. of yield with four waterings and this was found more economic than the cultivation of Brinjals and Chillies. As a result of these trials, it is hoped that the cultivation of Tobacco will be extended on a large scale in the coming season.

(8) *Improvements in sugarcane cultivation.*—In the face of very severe competition in the production of gul and sugar at a very low cost from other provinces and foreign countries the work which devolved on the staff on Deccan Canals, regarding sugarcane industry, consisted mainly of the introduction and extension of the most economic and richest varieties of sugarcane such as E.K. 28, P.O.J. 2878, Co. 290 and of the propaganda of improved and scientific methods of sugarcane cultivation so as to reduce cost. Reduction in top-dressing manuring, selection of sets, early planting, wider sowing so as to allow bullock labour to be used for inter-tillage which is cheaper than manual labour sann green manuring, deep ploughing by Gallows plough and the use of minimum quantity of water by slow irrigation method so as to prevent damage to soil from water-logging and salt efflorescence are the improvements which have been largely adopted by the cane-growers at the instance of the Departmental staff. This year 75,000 lbs. of Sann seed was distributed for sann green manuring and there was natural spread also and now every irrigator is fully realising the benefits accruing from green manuring to sugarcane crop especially in the reduction of cost for bulky manure. Even at the lowest average rate of Rs. 12 per palla of gul in this season skilful irrigators have made a profit of Rs. 50 per acre from sugarcane crop and they could do this only on account of the most extensive and strenuous propaganda of the Department.

(9) *Improvement of rice.*—The practice of multiplication of seed of the improved rice strains through the Registered Seed-Growers was continued as usual. In all 6,900 lbs. of Panwel No. 61, Kolamba No. 184, 401 and 42 were distributed to the seed-growers for an area of 150 acres. The heavy rains of September spoiled a good deal of crop and only 60,000 lbs. of good seed was made available for distribution to the general public and it was sufficient for 1,200 acres.

(10) *Introduction of Improved Nagli Strains.*—This work was also continued on the lines given in the last year's report. During this year, 2,800 lbs. of the improved strains were supplied to the Registered Seed-Growers for an area of 300 acres. 7,000 lbs. of seed is now available for supplying to the public which would be sufficient for about 1,000 acres. As the cultivation of Nagli is generally done by the most backward and illiterate people, some difficulty was experienced in preserving their stock for general distribution.

The trials of A.16 and B.11 were made in the Satara District and it was found that B.11 has given 25 per cent. more yield over the local; but A.16 was too late for this tract.

(11) *Dry-farming.*—The use of graded seed of Jowar mixed with sulphur, sowing with improved seed-drill in plots with low bunds to check surface erosion and constant inter-culturings are the important operations to ensure the success of dry-farming. During the year, the

comparative trials of dry-farming *vs.* local method were made in the Deccan and the results are given below :—

Name of district.	Name of crop.	Yield per acre in lbs.	
		Dry-farming method.	Local method.
Sholapur ..	Jowar	284	175
	Gram	512	168
Nagar ..	Jowar	475(average)	374(average)

In Poona District the work of extending dry-farming has now been increased to 2,500 acres in the Sirur Peta and Bhimthadi and Indapur Talukas. The cultivators have now been convinced of the advantages of this system.

In Nagar District special sets of dry-farming tools have been kept in 51 villages, and about 1,560 acres have been sown under the dry-farming system. The work has, however, been hampered for want of funds and the curtailment of the temporary staff.

(12) *Seed grading.*—The importance of selecting seed by means of sieves is now made known to the public and during the year under report, the following quantities of seed were graded :—

Name of district.	Name of seed.	Quantity of seed sieved.
(1) Poona District	Bajri	43,650
	Jowar	18,780
	Wheat	38,860
(2) Satara District	Jowar	92,550
(3) Sholapur District	Jowar	1,99,322
	Groundnut	17,600
	Akola Bajri	400
	Pusa Wheat ..	1,000
(4) Ahmednagar District	Bajri	6,600
	Jowar	13,939
	Wheat	7,079

(13) *The Soaking Compartments at Belvandi.*—The work mentioned on page 81 of the last year's report was further continued during the year, but on account of the heavy rains in the month of September and October, the sowing could not be done till the end of October 1933.

All the compartments were flooded three times during the year. The outturn was, however, low on account of the cold wave in January 1934. The yields are given below :—

Treatment.	Yield per acre.	
	Grain.	Fodder.
	lbs.	lbs.
Soaked compartments	282	657
Check plot	205	550

(14) *The Boshi Cultivation (Sind Method of Flooding).*—The experiment was again repeated at Pimpri and the yields are given below :—

Treatment.	Yield per acre.	
	Grain.	Fodder.
	lbs.	lbs.
Boshi method	570	1,220
Check plot	260	580

(15) *Implement Depots.*—Most of the implement depots in Satara, Poona and Ahmednagar Districts have now been handed over to the Taluka Agricultural Development Associations. A few depots have now been conducted by the staff of the Agricultural Department on the Deccan Canals and in Ahmednagar and Poona Districts. From the 15 implement depots the total hire collected was Rs. 438–13–0. It is the policy of the Department to entrust this work to private Institutions and local merchants who should undertake the business of supplying the implements to the needy cultivators. During the year under report, the Trustees of the Sir Sassoon David Trust Fund have given a grant of Rs. 1,500 for the purchase of Ridgers and Gallows Ploughs on the Deccan Canals. It is presumed that the cane-growers will take advantage of these implements.

(16) *Crop Pests and Diseases.*—During the year under report, the kharif crops badly suffered from Insect Pests and Fungus diseases due to the want of rain. In Poona District, the Kharif Potatoes were very badly affected by rust and borers and although the spraying of sulphur was attended to, this disease could not be checked. The crop yielded only 6 annas outturn. In Saswad Taluka a vigorous campaign of dusting this crop was undertaken for over an area of 55 acres and about 1,100 lbs. of sulphur dust was utilised. This treatment had good effect upon the crop.

(17) *Eradication of Prickly-pear.*—The destruction of Prickly-pear by the Cochineal insects has been widely known to the public and all the District Local Boards are now making special efforts to undertake this work on a large scale. In Poona, Satara and Sholapur districts most of the villages are now free from the prickly-pear and in the course of a year or two, it is hoped that, this troublesome plant will be altogether extinct in all the Districts.

(18) *Campaign against Rats.*—The field rats were again attacking the sugarcane crop on the Godavari Canals, where a special campaign was arranged to destroy them by fumigating the burrows with cyano gas. Similar campaigns were arranged in Poona and Satara Districts with great success.

(19) *Fruit and Vegetable.*—The work of extending the cultivation of fruit was carried with greater vigour during this year, as the people could not get sufficient remuneration from the dry crops. In Satara District, about 13,000 plants consisting of mango grafts, oranges, pomegranets and plantains were distributed; while in Ahmednagar District about 12,000 plants have been supplied. The demand for mango grafts in Ratnagiri was so great that it could hardly be satisfied in full.

In the Ratnagiri District, special attempts were made to raise the seedlings of chillies, tomatoes, brinjals, cabbage and knolkhol etc. with the help of the Taluka Development Associations and they were distributed to the general public at a cheap rate.

(20) *Dusting against Mango Grafts.*—This item has become a permanent feature of the district work in Ratnagiri District. The staff demonstrated dusting to 60 new centres and in all 6,000 mango grafts were dusted. About 80 dusting machines are working in Ratnagiri District and in all 8 tons of sulphur was utilised.

(21) *Grading and Packing of Mangoes.*—The effect of the past two or three years' work is now seen in the Ratnagiri District where almost all the merchants have adopted this method. During the year, nearly 50 per cent. of the produce was graded and sent to Bombay. Packing the mangoes in wooden boxes and tins has become very common.

(22) *Manufacture of dried Mango Pulp.*—Since last year, there is a great demand for dried mango pulp in the market. This pulp is generally manufactured from Alphonso and Piary varieties of mangoes when the prices come down and the steamer communication with Ratnagiri District is stopped. This pulp fetches very good price as it is required by up-country sweet-meat makers.

(23) *Sugar-making by Open Pan Process.*—In the last year's Annual Report it has been mentioned that owing to the low prices of gul the attention of the cane-growers was directed to sugar-making by Open Pan Process; during the year under report the Department conducted one demonstration of sugar-making by Open Pan Process at Hol on Nira Left Bank Canal investing Rs. 7,500 in the purchase and erection of the machinery. The Bombay Provincial Co-operative Bank also conducted a similar demonstration at Nira-Wagaj on Nira Left Bank Canal; side by side, private individuals also invested money in this

kind of sugar industry and during the year 1933–34 the following sugar-making plants were working at the various centres of the Deccan Canals :—

Name of the owner.	Place.	Size and number of centrifugal machines.	Kind of crusher used.	Variety of cane crushed.	Area of sugarcane crop crushed and turned into sugar and molass-in gul in acres.
1	2	3	4	5	6
Bombay Department of Agriculture.	Hol ..	18" diameter three ..	Vasant crusher.	Pundia ..	15 acres.
Bombay Provincial Co-operative Bank.	Nira Wagaj	18" diameter three ..	Vasant crusher.	Pundia ..	30 acres.
Mr. Bhikoba Shankarrao Dhumal.	Shirawali ..	18" diameter four ..	Chattanooga No. 92.	Pundia ..	40 acres.
Mr. Chandrabhan Rupchand.	Deolali ..	18" diameter four ..	Chattanooga No. 92.	E.K. 28 and P.O.J. 2878.	40 acres.
Mr. Magniram Fakirchand.	Shirasgaon	32" diameter two ..	Chattanooga No. 92.	E.K. 28 and P.O.J. 2878.	40 acres.
Mr. N. B. Jagtap ..	Umbergaon	32" diameter one ..	Chattanooga No. 92.	E.K. 28 and P.O.J. 2878.	22 acres.
Mr. B. K. Kulkarni ..	Satral ..	18" diameter one ..	Bullock crusher.	E.K. 28 ..	10 acres.
Mr. D. K. Bhatarkar ..	Chinchol ..	32" diameter one ..	Chhatanooga No. 45.	The centrifugal machine was not used as the crop was sold to sugar factory.	

There were thus eight places on Deccan Canals where sugar-making was done. The variety E.K. 28 and P.O.J. 2878 was crushed at some places; at other places only Pundia was available. E.K. 28 gave 6·25 recovery of 1st sugar and 1·75 recovery of 2nd sugar. At Hol the recovery of sugar was 5·8.

At Hol the Brix varied from 17 to 21·5 for Pundia while that of E.K. 28 was 21 to 22. The average yield of cane was 38 to 42 tons. Taking the average yield of 40 tons of cane per acre the sugar obtained was 40 × 5·8 equals 2·3 tons of 1st sugar where Pundia was crushed. No 2nd sugar was prepared but only gul was made from the molasses boiled in the proportion of 6 tins molasses with 4 tins of water. 20 Pallas of 2nd grade gul was obtained per acre from the molasses. The rate obtained for sugar was Rs. 8–2–0 per maund of 82 lbs. while the rate for gul varied from Rs. 8 to Rs. 10 per palla.

On an average the irrigator got—

	Rs.	a.	p.
20 pallas of sugar at Rs. 24–6–0	487	8	0
plus			
20 pallas of gul at Rs. 9–0–0	180	0	0
Total realisation ..	667	8	0

The expenses of manufacture of sugar and gul were Rs. 3-8-0 per ton of cane. So the net realisations were :—

Rs. 667-8-0 — Rs. 140-0-0 = Rs. 527-8-0.

Had he prepared gul only he would have got 40 pallas of gul which would have been sold at Rs. 12 per palla, realising only Rs. 480 minus Rs. 80 the manufacturing charges, the net realisations being only Rs. 400 from gul-making alone as against Rs. 527-8-0 from sugar and gul-making.

The price of sugar obtained was lower while the price fetched by the molassin gul was more than that of last year and at most of the above places gul was prepared from the 1st molasses instead of 2nd sugar.

In Satara District, similar trials of making sugar by Open Pan Process were made at Kundal, Karad, Kole, Aitwade, Vadgaon and Kadoli with fair success. At Kadoli, the cane-growers manufactured rab on their own furnaces and it was taken to the central sugar-making plant for the manufacture of sugar and gul. The price realised for sugar in Satara District was Rs. 9-8-0 per maund and it was very much appreciated by sweetmeat makers. In point of sweetness the Khandsari sugar is really superior to the factory product. A detailed report regarding the working of the Government Plant has now been submitted and probably it will be published by the Department.

(24) *Sugar factories.*—On page 85 of the last year's report names of the six new sugar factories have been given. A brief description of this year's progress is given below :—

(1) *The Saswad Mali Sugar Factory, Akluj.*—Erection of the machinery is almost complete ; but, they could not start the work as the season was very much advanced. The factory has got about 900 acres under cane, some of which was sold to Kalam Factory.

(2) *The Phaltan Sugar Factory at Pimpalwadi.*—The factory was started in February 1934 and had worked for about a couple of months. This is a factory of 550 tons capacity for which a large amount of cane is required. They have now planted 500 acres of cane and are still depending for the additional supply of cane from the cultivators.

(3) *Messrs. Marsland Price & Co. Ltd., Kalam, District Poona.*—Erection of this factory was completed and the work was started by the end of March. It had worked for about two months during the year. The Company has planted about 900 acres of cane under the new varieties, viz. E.K. 28, P.O.J. 2878 and Co. 290.

(4) *The Maharashtra Sugar Mills Ltd. at Khandala.*—Erection was completed and the working was started in April 1934. It has also worked for a couple of months. The Company has planted 500 acres under cane.

(5) *The Ravalgaon Sugar Factory* was completed in November 1933 and the working was started from December 1933. It was working for nearly 5 months during the season. At present the Company has got about 800 acres under cane.

(6) *The Kolhapur Sugar Mill Ltd.* completed its erection in the month of December 1933 and it had worked for nearly 5 months. At present the Company has got 600 acres under cane.

The Belapur Company has progressed very satisfactorily during the year and has given yield of 42 tons of average yield of cane from an area of 2,700 acres. Its recovery is also highest, a little over 11 per cent. and it will stand first in the whole of India.

Two more factories are being erected—one at Belvandi and the other at Mundwa ; but the Proprietors are still considering whether they can manufacture sugar and gul in order to avoid any losses of molasses. This idea was suggested to them from the results of the Open Pan Process in which both sugar and gul are manufactured.

(25) *Shows and Demonstrations.*—During the year under report 231 demonstrations and 21 Jamabandi meetings were held which were largely attended by cultivators. Twelve big Agricultural Shows were also held, a short description of which is given below :—

(1) A big district show was organised at Mulegaon in the Sholapur District on the 3rd, 4th and 5th of February 1934. This was organised by the Village Improvement Committee of Sholapur. It was opened by the Commissioner, Central Division. All the agricultural sections, including cattle were arranged and it was attended by more than 10,000 people. This was a centre of village uplift and the work done by the Villagers was worth seeing.

(2) Another agricultural show was held at Sholapur at the time of Gadda fair in the month of January 1934. It was attended by 5,000 people. The Collector of Sholapur opened the exhibition. This fair is usually held for a week and the Village Improvement Committee has made this as an annual fixture.

(3) A very big show was organised at the time of His Excellency's Patil Darbar held at Ahmednagar on 31st October 1933. The Show was opened by His Excellency the Governor of Bombay and it was attended by 15,000 people. This show mainly consisted of all the activities of the Agricultural Department and all the expenditure was done from the Presidency Agricultural Show Fund.

(4) At Shiposhi in the Ratnagiri District a big show was arranged with the demonstration of the standing crops in the month of October 1933 in which all the leading members of the Co-operative Societies had taken an active part.

(5) At Kondanpur a big show was arranged with the help of the Deccan Agricultural Association in the month of January 1934. This was attended by 20,000 people. Special prizes for the workers of Village Uplift were given in this show.

(6) Another show was arranged at Saswad in the month of March which was opened by the Revenue Member of the Bombay Government. It was attended by 5,000 people.

(7) In the Satara District, the Taluka Development Association, Tasgaon, had arranged a big show at Audumbar at the time of the fair. This was attended by more than 20,000 people.

(8) Another show was arranged at Kundal in the month of March 1934 in which sugar-making was demonstrated. It was presided by the Chief of Aundh who had taken very active part in agricultural improvements.

(9) At Uran the Walwa Taluka Development Association had arranged a big show which was attended by 15,000 people.

(10) At Khatgun another show was arranged by the Taluka Development Association, Khatav, which was also largely attended.

(11) At Shingnapur an Agricultural and Cattle show was arranged which was visited by 2,000 people.

(12) A very interesting Fruit Show was arranged at Satara in the month of May 1933 which was opened by Dr. Cheema, the Horticulturist to Government of Bombay.

In all these shows, the staff of the Agricultural Department had taken an active part and the success of these shows is mostly due to their efforts.

(26) *Agricultural Classes.*—During the year under report, in all 18 classes on Agricultural Subjects were arranged. The classes were conducted from 2 to 7 days and each class was attended by 25 to 60 students. A special class on sugar-making was arranged at Hol, in the month of April which was attended by 50 students from all parts of Canals as well as from Native States like Kolhapur, Aundh, Phaltan, Hyderabad and Indore. The students were given regular training in all the operations of sugar and gul-making.

At Satara a class on poultry management was arranged which was attended by 40 students.

The utility of such classes is more marked and the demand is constantly increasing.

(27) *Rural Uplift Work.*—During this year, the work of rural uplift received great impetus on account of the keen interest taken by His Excellency Sir Frederick Sykes, the Ex-Governor of Bombay. He has not left a single opportunity in private or public meetings to express the necessity of Rural Uplift work which is the only means of improving the condition of agriculturist. His brochure on village uplift and the Manual of Instructions for Government Officers in connection with the village improvement scheme are very valuable. Most of the Districts have now formed their District and other sub-committees and the work is progressing with the help and co-operation of non-officials.

In the Sholapur District, the Village Improvement Committee has taken 5 villages for this Rural Uplift work and the efforts are being concentrated at Kumbhari and Mulegaon. It has arranged several classes for educating the public on agriculture, sanitation, education, communication etc., and the work is receiving a fair success.

In the Satara District, the Collector is also taking personal interest in the uplift work and has opened ten centres for organising the work. Simple improvements such as the supply of best seed, grading, treatment of jowar with sulphur, distribution of pusa wheat etc., have been already brought into action and the cultivators are taking their advantages.

In Poona District, the work has been divided into three sub-committees and the Deputy Director of Agriculture, South Central Division, Poona, has been elected as the Chairman of the Agricultural sub-committee. This committee has taken in hand supply of pure seed, Italian potatoes, land development and marketing of produce and the question of funds required for all these improvements is being considered.

In Ahmednagar District, the Collector called three meetings and the programme of work is chalked out. The main question in this District is of dry farming, the principles of which should be impressed on all the cultivators.

Before finishing this item I should explain briefly the work done by the Deccan Agricultural Association in connection with the Rural Uplift at Khed Shivapur Centre. This work is being organised for the last five years and the villagers have now begun to realise the advantages of this work. It has carried out all the simple improvements such as grading of jowar, sulphur dusting, wide sowing, introduction of Pusa wheat, treatment of Gummosis, removing loranthus etc. The total money value of these improvements was estimated at 9,247 Rupees. The implement depot was conducted with 24 iron ploughs from which an hire of Rs. 136-9-6 was collected. The value of this improvement was estimated at 2,800 Rupees. Two classes—one on Horticulture and another on land development were arranged. One big show at Kondanpur was organised. Medical help is given by the Poona Seva Sadan Society and adult education, library, gymnasium etc., are the common activities of this Association.

An economic survey of the village Arvi has been made and the report will be published shortly.

(28) *Supply of seeds, manure and implements.*—As usual all the staff had undertaken the distribution of seeds, manures and implements with the help of private agencies of different firms. During the year under report, the following articles are supplied :—

Serial No.	Name of article.	Canal area.	Poona.	Ahmed-nagar.	Satara.	Shola-pur.	Ratnagiri.	Total.
	Seeds.							
1	Sets of sugar cane varieties..	8,20,000	..	..	..	..	....	8,20,000
2	Cotton seed ..	21,000	2,000	9,398	5,000	..	....	37,398
3	Groundnut ..	15,000	600	..	8,729	..	....	24,329
4	Akola Bajri ..	2,500	240	6,600	1,065	..	....	10,405

Serial No.	Name of article.	Canal area.	Poona.	Ahmednagar.	Satara.	Sholapur.	Ratnagiri.	Total.
5	Pusa wheat ..	9,000	3,000	710	2,386	..	....	15,096
6	Dhaincha seed ..	520	..	..	..	..	....	520
7	Jowar seed ..	1,100	..	500	368	2,000	....	3,968
8	Rice seed ..	400	..	..	327	..	66,900	67,627
9	Nilva ..	1,000	800	..	..	..	....	1,800
10	Sann seed ..	75,000	..	800	224	..	....	76,024
11	Tobacco seed ..	....	..	1	1	..	....	2
12	Potatoes ..	....	600	1,840	7,736	..	....	10,176
13	Fruit plants ..	....	6,000	1,000	11,616	..	....	18,616
14	Lucerne ..	....	..	400	33	..	9,800	10,233
15	Nagali ..	....	..	..	78	..	....	78
16	Vegetable seedlings ..	....	..	30	12	..	15	57
17	Turmeric sets ..	....	..	2,208	..	..	....	2,208
18	Ginger sets ..	....	..	740	..	..	....	740
19	Mango grafts ..	....	100	..	1,497	..	3,000	4,597
	Manures.							
1	Sulphate of Ammonia ..	22,40,000	2,240	5,520	15,548	500	3,36,900	25,99,808
2	Nicifos ..	....	..	200	3,115	..	26,800	30,115
3	Sulphate of Potash ..	2,000	240	..	60	..	17,920	20,220
4	Nitrate of soda .	2,000	240	50	..	..	....	2,290
5	Super Phosphate	5,000	..	..	20	..	....	5,020
6	Oil-cake ..	50,00,000	3,240	..	446	..	....	50,03,686
7	Bone-meal ..	....	240	4,800	..	..	22,400	27,440
8	Denaturalised salt ..	....	..	..	..	..	....	1,425 (Mds.)
	Implements.							
1	Cane crushers ..	12	..	..	..	..	....	12
2	Iron ploughs ..	197	23	55	60	44	5	284
3	Cyanogas pump.	4	1	..	..	..	....	5
4	Grading sieves ..	....	..	15	65	205	....	285
5	Dutch hoes ..	....	..	..	25	..	....	25

(29) *Demonstration Plots.*—During the year under report the following demonstration plots were arranged in this Division :—

(1) Canal tract	.. .. ..	375
(2) Poona	.. .. ..	60
(3) Satara	.. .. ..	74
(4) Nagar	.. .. ..	183
(5) Ratnagiri	.. .. ..	105
(6) Sholapur	.. .. ..	34
	Total ..	831

(30) *Propaganda through the Village School Teachers.*—The mass propaganda through village school teachers has become successful in Barsi Taluka of Sholapur District, during the past three seasons. During this year, 11 villages in the Karmala Taluka were selected for mass propaganda through the school teachers. Simple improvements were effected through this agency. The work done during this year is given below :—

Grading of jowar	.. 9,632 lbs.
Mixing jowar seed with sulphur ..	.. 7,478 lbs.
Total area under supervision ..	.. 2,400 acres.

The teachers arranged 22 crop demonstrations and they were given remuneration of Rs. 3 per head as an honorarium.

In the Poona District, the same village teachers had undertaken the work of propaganda with more marked results. The work done by the teachers of (1) Vir, (2) Vagholi, and (3) Dehu, deserves special mention.

In the Nagar District, 51 sets of dry farming implements were entrusted to the village teachers for rendering the necessary help to the agriculturists in dry farming. During the year under report, 63 sets have been prepared by the villagers themselves and the work is being conducted with the help of village school teachers. The progress of work, however, is retarted on account of the retrenchment of three Kamgars during the year.

(31) *Publications.*—During the year under report, the following bulletin and two leaflets were completed :—

Serial No.	Name of leaflet or bulletin	English	Marathi
	Bulletin.		
1	"The manufacture of White Sugar and Gul by open pan process"	1	..
	Leaflets.		
2	Leaflet No. 7 of 1933 on "Iron Plough"	1	1
3	Leaflet No. 1 of 1934 on "Pachat as Manure for Sugarcane"	..	1

The staff also contributed several articles to the Shetki and Shetkari Magazine and College Magazine etc. Besides, as usual, short reports on crop and weather conditions, demonstration plots etc., were regularly supplied to the *Times of India* through the local reporter.

Section III.

Agricultural Organization.

(1) *Taluka Development Associations.*—During the year under report, 3 more Taluka Development Associations were registered, viz. Shevgaon, Devagad and Man and thus the total number of the Taluka Development Associations has become 22 in South Central Division. The preliminary work of organizing new Associations at Mahableshwar, Newasa and Chiplun is almost finished and it is hoped that they will be registered shortly. Among the 22 Associations, the Taluka Development Associations of Satara, Tasgaon, Walwa and Karad of the Satara District and Dapoli and Malwan of the Ratnagiri District have put in very good agricultural work and they are classed under "A". The remaining Associations in other districts have been classed under "B". The Ratnagiri Taluka Development Association is much improved and will be classed between "B" and "C". The Nira Left Bank Canal Agricultural Development Association at Baramati has not done any work and probably it will have to be discontinued.

The District Local Board of Satara has again taken keen interest in the development of the new Associations and has sanctioned a grant of Rs. 1,000 and Rs. 500 to Mahableshwar and Man Associations.

(2) *Non-Credit Societies.*—The number of such Societies in South Central Division is 25. During the year under report, the mango sale society at Ratnagiri was cancelled while two Societies, viz. Rui-chattishi Agricultural Requisite Supply Society and Mundva Agricultural Co-operative Machinery and Implements Society were newly registered.

Section IV.

Agricultural Services.

(1) *Engineering Advice and Assistance.*—As a result of the Propaganda made by the entire staff of the Deputy Director of Agriculture, South Central Division, Poona, there were several demands from the farmers for the services of the Mechanical Assistant to visit their sites and to estimate the cost of installing various sizes and types of Pumps and sugar and gul making plants.

The actual number of plants erected at various sites during the year under report was as under:—

Sugar-making Plants.

(1) 1 of 34 BHP Blackstone Cold Start Crude Oil Engine "LSI" type; 92 Chattanooga Cane Mills; 4 sugar centrifugal machines 18″ × 9″ size (3 by Kirloskar Bros. and 1 by Broadbent); 1 Disintegrater No. 0 by Norris & Christie; 1 juice pump 1½″ size; 1 Flour Mill 18″; 46′ × 2½″ Counter Shaft; 3 improved multiple furnaces; masonry tanks for storing 1st and 2nd rab and sugar drying yard

and cor-iron sheds etc., for Mr. Bhikoba Shankarrao Dhumal of Shiroli on Nira Left Bank Canal.

(2) 1 of 18 BHP Blackstone Hopper Cooled Crude Oil Engine; 1 "Vasant" Cane Mill; 3 sugar centrifugal machines; 1 juice pump $1\frac{1}{2}''$ all of Kirloskar make; 1 improved pug mill; 1 improved multiple furnace and 1 Poona improved furnace and the whole machinery with a $36' \times 2\frac{1}{2}''$ Counter Shaft fitted on special portable frame for the Agricultural Department at Hol, on the Nira Left Bank Canal.

(3) 1 Complete Plant of the type and capacity mentioned above erected at Nira-Wagaj for the Bombay Provincial Co-operative Bank, Limited, Bombay.

(4) 1 Improved Poona type furnace with door and Chimney arrangement for the Kundal Show, Aundh State.

(5) 1 Improved Multiple furnace with damper and door arrangement and help in the erection of 15 BHP Hindustan Cold Start Crude Oil Engine; 2 sugar Centrifugal Machines $18'' \times 12''$ at Kole near Karad for the Taluka Development Association, Karad, district Satara.

(6) Measurement and instructions given to the Walwa Taluka Co-operative Development Association, Islampur, for the erection of 1 Poona Type improved furnace with door and chimney arrangement for the sugar making demonstration Aitawade near Islampur, district Satara.

Gul-making Plant.

(7) A complete erection of a large gul making plant comprising 1 of 34 BHP Blackstone Cold Start Crude Oil Engine, 1 Manlove Alliott Cane Mill $14'' \times 21''$ of 3 Roll Type; $2''$ Gayunes' Centrifugal Pump for juice; 2 large masonry tanks for storing juice and water for the circulation of the engine; 1 counter shaft $16'' \times 3''$; engine shed and a battery of 2 large type of improved furnaces with door and damper arrangement for the use of $9'$ diameter boiling pans for the Mundwa Machinery and Implements Society, Mundwa, near Hadapsar, district Poona.

Site Selection for the installation of Pumping Plants.

Three wells were visited during the year under report to estimate the cost of installing pumping plants. Out of these, 2 were at Shera and Kole for Sirdar Mutalik and Mr. Annapa Kalyani, respectively, and the 3rd was for Mr. Puranik at Shirgonda, district Ahmednagar.

New erections undertaken for completion before next winter begins, are as under.

(1) A complete erection of the sugar making plant (belonging to the Agricultural Department, which worked last time at Hol) for Mr. Krishnaji Khanduji Patil of Manjri for the next crushing season,

(2) Pumping Plant on well at Bagal Khas near Manjri Bdk. comprising 11·4 BHP. Shanks' Cold Start Crude Oil Engine and a 4″ Gwynnes' Centrifugal Pump for Mr. K. K. Patil.

(3) 5 BHP. Hopper Cooled Blackstone Crude Oil Engine with 3″ Gwynnes' Centrifugal Pump on well for Mr. Balasaheb Laduji Dhamdhere at Talegaon Dhamdhere, District Poona.

(4) One 30″ Sugar Centrifugal Machine for Mr. Namdeo Mayaji Kalbhore, near Loni Kalbhore to be added to the crushing and pumping plant already installed for the party, by the Department.

Help rendered for the correction of the crushing plant foundation by oral instructions on the spot to Mr. Nanasaheb Jagtap, Dhakalkar, near Belapur.

New Designs made and used in the working of the sugar and gul making plants by Mr. Peter Rahater during the year under report.

(1) Improved multiple furnace with Iron Door and Damper used and the fire grate position shifted 15″ away from the original (central) place towards the firing mouth. This gave a reduction in the fuel consumption.

(2) Fire-door and chimney attached to the Poona Furnace and its fire grate (original central position) position is shifted by 15″ towards the firing door for better combustion of the fuel and to stop flames coming out of the feeding mouth.

(3) Boiling pans made to have their bottoms of $\frac{1}{4}$″ thick plate and their sides finished with $\frac{1}{8}$″ plate. This helped to get nearly 3 per cent. more crystals of sugar of large size.

(4) Pug-Mill having longer beaters than those of other make mills and this arrangement broke the clods of the Rab easily and readily without damaging crystals.

(5) A large Portable Girder Frame made out of rolled beams and angle iron and a complete set of sugar making machinery composing of machines and a 36 ft. × $2\frac{1}{2}$″ counter shaft fitted on it and the whole can be dismantled and removed to other site of operation without incurring any expenditure on its foundation.

All the above designs were actually used during the year under report in the case of the sugar-making plants mentioned above and the whole thing gave complete satisfaction and at the same time more hints worth adopting were obtained for use in the next year's season.

Section V.

Miscellaneous.

Co-ordination of Officers of other Departments.—During the year there were several occasions for co-ordinating with the officers of Revenue, Irrigation and Forest Departments on account of the Rural Uplift work, officially started during this year. As stated in the body of the report

there are district committees in each district for the rural uplift work in which the Deputy Director and his staff are taking full responsibility of this work. Such meetings are generally held once or twice each quarter in which the agricultural programmes are chalked out; Besides there were jamabandi demonstrations in which the information on agricultural subjects forms the major part of the function. The relations with the officers of the Irrigation Department are also more sympathetic and several meetings were held on the Deccan Canals in which Officers of both the Departments co-ordinated. The Officers of the Irrigation Department used to explain the canal rules and some of their problems concerning supply of water and the Officers of the Agricultural Department explained the agricultural improvements to be effected on the canal area. By this division of work there was no difficulty for repetition of the work done by these two Departments. In most of these meetings either the Executive Engineer or his Assistant presided.

The Co-operative Societies are undertaking agricultural improvements on a large scale and it is healthy sign of the movement. The District Local Board of Satara and Sholapur have given full co-operation in introducing the agricultural improvements in their districts.

Divisional Board of Agriculture.—The chairmanship of the Deccan Divisional Board of Agriculture was taken by the Deputy Director of Agriculture, Since 1st November 1933 and since then three meetings were held at Poona, Baramati and Wai. New non-official members have been nominated since 1st April 1933 and they are taking very keen interest in the proceedings.

Before concluding this report, I have to express my sincere thanks to the following Officers and private gentlemen for rendering very valuable services to the cause of agriculture in this Division :—

(1) Hamid Moizudin Abdul Ali, Esquire, B.A., I.C.S., Collector of Satara.

(2) Duncan MacLachlan, Esquire, I.C.S., J.P., Collector of Poona.

(3) K. S. Jatar, Esquire, C.I.E., Poona, (retired Commissioner).

(4) Syed S. L. Inamdar, Esquire, Member, Agricultural Sub-Committee of the Rural Uplift Committee of Poona District.

(5) Annapa Narayan Kalyani, Esquire, President, District Local Board, Satara.

(6) Rao Bahadur N. C. Limaye, B.A., LL.B., Secretary, Village Improvement Committee, Sholapur.

(7) S. N. Kurhade, Esquire, B.Ag., Chief Officer, District Local Board, Sholapur.

(Signed) V. V. GADGIL,
Deputy Director of Agriculture,
South Central Division,
Poona.

Poona, 7th August 1934.

Programme of Work for the year 1934-35 in the South Central Division.

Research.

Kopergaon Farm.

(1) The programme mentioned on page 99 of the printed report for the last year will be continued with the addition of the multiplication of Banilla Cotton and Spanish peanut.

Mohol Farm.

(1) The programme on page 99 of the printed report for the last year, will be further conducted and the trial of Banilla Cotton, Spanish peanut and Big Japan, will be made.

Ratnagiri Farm.

(1) The programme on page 99 of the printed report for the last year, will be conducted.

(2) The Varangal Strains will be tried at Chiplun.

(3) At Hatkhamba, the plantation of cashew nut will be extended upto 5 acres.

Propaganda.

The propaganda work will be undertaken on the following lines :—

(1) All the programme mentioned on page 100 of the printed report for the last year, will be further carried out on extended scale.

(2) Arrangement of seed, grown from Banilla Cotton.

(Signed) V. V. GADGIL,
Deputy Director of Agriculture,
South Central Division,
Poona.

Poona, 7th August 1934.

APPENDIX E.

Summary of Work done under the Deputy Director of Agriculture, Southern Division, Dharwar, for the Year 1933-34.

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, Dharwar, throughout the year. Rao Saheb G. L. Kottur continued as Cotton Breeder and Mr. R. Y. Hulkoti, as Cotton Superintendent, S. M. C., Dharwar. Mr. K. D. Gumaste, Superintendent, Dharwar Farm, was deputed to Dry Farming Research Scheme at Bijapur and Mr. S. G. Kadkol, District Agricultural Overseer, Gadag, was appointed Superintendent, Dharwar Farm. The temporary staff entertained for various works in the Division mentioned in last year's report continued. During the year under report, one graduate and two non-graduate assistants were newly appointed for one year to investigate the "Small Leaf" disease of cotton and one graduate assistant for six months to enquire into the extra factory consumption of cotton. Both these schemes have been financied by the Indian Central Cotton Committee.

Season.

(2) The Agricultural season during the year under report, was characterised by heavy rainfall. There were good anti-monsoon and early monsoon rains which were useful for the preparation of land and for sowing early kharif crops like paddy, groundnut and udid. Owing to these favourable early rains, the area under groundnut was considerably increased all over the Southern Division. The rains in July, August and September were rather heavy and continuous and jowar and cotton sowings were, therefore, delayed. All kharif crops except paddy, suffered from excess of moisture and rank growth of weeds. Timely interculturing operations were not possible and hand-weeding went very costly. Fair weather in November was favourable to most of the kharif crops. They revived to a certain extent but gave yields below normal. The season for rabi crops was good to start with. Rabi jowar was spoiled by rains in December and wheat was attacked by severe rust. The garden crops except betelnut, did well. On the whole, the agricultural season during the year under report was poor and the prevailing low prices of the agricultural produce which have continued for a long time did not enable the cultivators to pay off their land rent.

(3) The work done during the year is summarised under the same heads as it was done in previous years—(*a*) Research and Experiments, (*b*) Propaganda, (*c*) Organisation, (*d*) Services to the public, (*e*) Agricultural Education, and (*f*) General.

(*a*) *Research and Experiments.*

(4) *Dharwar Farm.*—Plant breeding work on cotton which is the main money crop of the Division continued to receive major attention. Jayawant cotton was compared for yield in six replicated plots with

other promising cottons. It gave significantly lower yield than Kumpta this year. The reason for this is that January rains induced the axillary vegetative growth more in Jayawant than in Kumpta and this delayed the flowering. The later-formed flowers shed more and formed smaller bolls. Taking 6 years' results together, Jayawant has given 522 lbs. kapas per acre whereas Kumpta 511 lbs.

The other important types of cotton in reserve are (1) Dharwar 1 × Dharwar 2, 1-01 ; (2) K. W. R. × 15, strain 17 ; (3) Dharwar 2 × 15 and (4) Jayawant × N. 14 . Dharwar 1 × Dharwar 2, 1-0-1 has given better yield than Jayawant. In ginning percentage and staple length it is as good as Jayawant and is earlier to mature by about a fortnight. If lateness of Jayawant goes against it, Dharwar 1 × Dharwar 2, 1-0-1 would be a good substitute. K. W. R. × 15, strain 17 is being compared with other cottons including Jayawant in replicated plots for the past 4 years and it has been giving higher yields than Jayawant. The average per acre yield of 4 years is 553 lbs. against 510 lbs. of Jayawant. It gins nearly 32 per cent. and is early by about a fortnight. The staple, however, is 0·84 inch long against 0·94 of Jayawant.

(5) The new crosses that were under observation were (1) Jayawant × 15, (2) Jayawant × Comilla, (3) Jayawant × Million Doller, (4) Dharwar 1 × Million Doller and (5) Dharwar 1 × Commilla. Jayawant × 15 has yielded high ginning types which gin from 30 to 35 per cent. Some of these are earlier by about a week. The length of staple, however, is not yet fixed. It varies from 23 to 26 m.m. Further selection is made to improve this character.

(6) *Performance of different Cottons against Wilt.*—Dharwar 1 was found to be highly susceptible to wilt both in field and green house. Jayawant, Dharwar 2, Farm Kumpta and Kumpta wilt resistant were found less susceptible than Dharwar 1. Wagale Shan and Comilla 4–2 were found to be resistant in field but completely susceptible in the green house. Million Doller, Kumpta Bailhongal 1–2 and Kumpta-Bailhongal 7–6 showed better resistance than Jayawant group. Gadag 1 was found immune in the field but not so in the green house.

(7) *Relation of Soil Moisture to the Incidence of Wilt.*—To determine this relation, the moisture in the plots was maintained at different degrees from 20 to 45 per cent. on the oven-dry basis. At 20 and 45 per cent. moisture, there was no germination of seed, the soil being too dry in one case and two wet in the other. The incidence of wilt at 27, 30, 35 and 40 per cent. moisture was the same (cent per cent.) though the period of incubation was different.

(8) *Hot Water Treatment of Cotton Seed against Wilt.*—The object of this investigation was to find out if it is possible to kill wilt fungus carried through seed by treatment with hot water. The thermal death point of the fungus and that of the seed was observed to be practically the same and it is difficult to bring the hot water treatment in practice among the cultivators.

(9) Selfing of Jayawant and Gadag 1 cottons was done as usual to meet the requirements of Hubli, Athani and Gadag seed Multiplication Schemes. In all 130 lbs. selfed seed of Jayawant, was produced for Hubli and Athani Schemes, on Dharwar farm, and 150 lbs. of Gadag 1 for Gadag Scheme on Gadag farm.

(10) *American Cotton Work.*—Dharwar American 2-6-5 was compared with Gadag 1 at Dharwar and Gadag in 6 replications and it yielded less on both places. The experiment will be repeated. Selections in Negloor-Dharwar-American made for earliness have given some pure lines which have also resisted Red Leaf better than Gadag 1. The three crosses, viz. (1) Dharwar-American-Ron × Co. 2, (2) Dharwar-American-Ron × Gadag 1, (3) Gadag 1 × Co. 2 were examined in their F2 generation and selection was made for earliness, resistance to Red Leaf disease and other economic characters.

(11) *Spinning Tests.*—Ten samples were sent to the Director of Technological Laboratory, Matunga, for testing their spinning value and the following are the results :—

Dharwar 1 (31s), Jayawant (36s), K.W.R. × 15, strain 17 (36s) Gadag 1 (34s), Kumpta Bailhongal 7 (30s) Dharwar 2 × 15-1-1 (31s), Dharwar 2 × 15-3-2 (29s) Dharwar 1 × Dharwar 2 × 1-0-1 (34s), Dharwar 1 × Rosea 1A-14-3 (32s) and Dharwar-American 2-6-5 (35s.).

(12) *Seed Tests.*—61 samples of pedigree cotton seed stored for distribution in different places were tested as usual for their germination. The percentage of germination varied from 84 to 96 in Jayawant and from 78 to 90 in Gadag 1 cotton seed received from various places.

(13) *Small Leaf Disease in Cotton.*—This disease again appeared during the year under report soon after the heavy showers in January. Its incidence in different cottons on Dharwar farm was as follows :—

Jayawant 1·3 ; Dharwar 2, 1·6 ; Kumpta (farm) 1·7 ; Kumpta wilt resistant, 2·1 ; Kumpta-Bailhongal 1, 3·0 ; Kumpta-Bailhongal 7, 2·4 ; and K.W.R. × 15 strain 17, 0·7 ; Dharwar 1 × Ch 1, 0·8 ; Million Doller 0·0 ; Wagale 0·6 ; Shan 0·0 ; Comilla 0·1 ; Verum 7-1, 0·0 ; Dharwar 1 × Ch 2, 0·0.

(14) The selected strains of Fulgar white, Fulgar yellow, Bilichagan Nadyal and Savaner varieties of jowar were maintained and the seed was distributed to the cultivators from the Dharwar farm. In all 1,071 lbs. of Fulgar white, 275 lbs. of Fulgar yellow, 488 lbs. of Bilichagan and 716 lbs. of Nandyal variety of jowar were distributed from the Dharwar farm. Spanish peanut variety of groundnut strain 5 was sown over 16 acres 30 gunthas on Dharwar farm and 19,242 lbs. of seed were distributed round Dharwar, Gadag, Haveri and Bailhongal. Selection in Pondichery variety of groundnut was continued during the year and strain 8 was given out for trial on field scale. Selection in other erect varieties such as Virginia Tennessee has been taken up during the year under report.

(15) *Other crop Experiments on Dharwar Farm.*—Five varieties of jowar, viz. Nandyal, Fulgar white, Fulgar yellow, Bilichagan and Muddinandyal were compared on Fisher's method in five replications. Nandyal continued to give better yields than others. Five varieties of cotton, viz. Jayawant, Dharwar 1, Dharwar 2, Dharwar 1 × Rosea and Kumpta were compared on Fisher's method in five replications. Jayawant gave significantly lower yield than others. This is due to the lateness of the crop owing to excessive rains. Four varieties of wheat, viz. Local Bansi strain 103, Bansi strain 808 and Bansi strain 809 were compared. The experiment failed to produce any result owing to severe attack of rust. Four varieties of tobacco, viz. Nadiad, Adcock, Nipani and Kohali were compared on Fisher's method in five replications. Nadiad continued to give highest yield. Burmah gram was compared with local in ten replications according to Student's method. Local gave higher yield than Burmah.

(16) *Manurial Experiments.*—In the farm yard manure experiment, 15 tons per acre has given higher yield than others. 2½ tons farm yard manure per acre every year has produced most economic results during the year under report. The yields of cotton continued to vary with the quantity of manure given to jowar crop in the previous year. The results of Sann-green manuring on cotton continued to be encouraging.

(17) *Rotational and Cultural Experiments.*—In three year rotation experiment. Tobacco-jowar-cotton has continued to give better result than wheat-jowar-cotton or groundnut-jowar-cotton. In two year rotation experiment, the yield of jowar after groundnut was observed to be more than that after tobacco or cotton. In seed rate experiment on groundnut, there is very little difference between the results of 80, 100 and 120 lbs. Seed rate, and all these are found to be better than 60 lbs. seed rate. Cotton and groundnut in alternate rows has continued to give better results than cotton and groundnut in blocks. Seived jowar seed has given higher yield than unseived seed this year. With the object of studying closely at what distance bunds should be erected in black cotton soil and at what distance erosion begins, a new experiment was laid down. Observations on erosion will begin from the next season. Another new experiment conducted during the year was the trial of Sodium chlorate to destroy " hariali " a deep-rooted weed in black cotton soil. It was dusted at 300 lbs. per acre and observations were made week by week. There was no effect of Sodium chlorate on this weed.

(18) *Gokak Farm.*—Sugarcane continued to receive major attention on this farm. The average yield of gul per acre for the whole of the farm was 11,221 lbs. against 10·094 lbs. of last year. The area was also increased from 7 acres 26 gunthas to 10 acres and 4 gunthas. The net per acre average profit was Rs. 57 against Rs. 21 of last year. The higher net profits are mainly due to reduction in the cost of cultivation. The other paying crops were maize and tur, cotton and rala and

Co. 2 cotton. The following useful experiments were conducted on the farm :—

J. 213 was compared with local Pundia on karl soil and it gave better results. It was also compared with H.M. 544 in karl soil, but yielded less. 10 carts of farm yard manure per acre to J. 213 gave more net profits than 20 or 30 carts. 75 lbs. N. top dressing gave better results than 150 lbs. N. with J. 213, but 150 lbs. N. gave better results than 100 or 50 lbs. with Pundia. J. 213 planted 3 feet wide gave more yield than 4 feet. Maize and tur was compared with maize and cotton. Maize and cotton did better than maize and tur. Selection in maize was started on more scientific lines during the year under report. Selection in tur for wilt resistance was continued. A new method of selfing tur flowers has been devised. Cambodia cotton grown 3′ apart with one row of groundnut gave better results than cambodia cotton grown 4′ apart with two rows of groundnut. Co. 2 cotton was compared with Gadag No. 1 cotton according to student's method in 10 replications. Co. 2 continued to give better results than Gadag No. 1.

(19) *Nursery and Orchard.*—The nursery and the orchard on the Gokak farm continued to be a paying concern. The total receipts were Rs. 974 and the expenditure was Rs. 714 showing a net profit of Rs. 260 against Rs. 375 of last year. The demand for lemon seedlings and Santra, Mosumbi and seedless guava grafts is increasing year by year and the nursery on Gokak farm is meeting it very successfully.

(20) *Mugad Rice-Breeding Station.*—Four promising strains of Mugad, viz. Early No. 161, Inter Nos. 81 and 249 and Late No. 141 and three strains of Antersal, viz. Early No. 67, Inter No. 90 and Late No. 200 which yield more than local were maintained and multiplied on Mugad farm. 2,800 lbs. seed of Mugad strains sufficient for 35 acres and 2,300 lbs. seed of Antersal strains sufficient for 30 acres were produced for further multiplication in cultivators' fields. 24 strains of Mugad and 28 strains of Antersal were continued to be kept in reserve. A few of these were compared with standard strains and they have been found to be promising. Mugad Early Nos. 29 and 109, Mugad Inter No. 114, Mugad Late No. 2 and Antersal Inter Nos. 171 and 94 and Antersal Late Nos. 176 and 82 are the most promising among these. One Kolumba cross strain was compared with Mugad No. 81 and the trial will be repeated.

(21) Selection in Dodga variety of paddy was continued in its fourth year. 79 fresh samples were collected from all over the Division and grown in separate rows. 17 have been selected from these for further observation. 11 high yielding and early maturing strains referred to in paragraph 21 of last year's report were under close observations during the year under report, and an intensive study was made on the same. Some foreign rices are reported to yield higher than Indian rices. With a view to compare them, attempts were made to collect high yielding types from all over India and abroad. Some have been received and will be grown during the coming season. Observations on "Gonag" were continued.

(22) *Kumpta Farm.*—Rice breeding continued to be the main work of this farm. Early strain Nos. 1315 and 1061 were compared with local and were found to be high yielding. 1,800 lbs. of seed is available for multiplication in cultivators' fields during the coming season. The three late red "Halga" strain Nos. 244, 1501 and 1548 were compared according to Fisher's method with local Halga. Strain No. 244 gave significantly higher yield than local. The superiority of this strain over local was confirmed during the year under report and it has been decided to distribute the seed of this strain to the cultivators. 1,600 lbs. seed of this strain is available for the purpose. Selections in white Kernelled Halga variety of paddy suited for up-ghat talukas was continued. 16 strains have been earmarked and will be compared during the coming season with a view to find out what late-white kernelled variety in below-ghat talukas gives higher yield. Bile Halga, Bile Pandya, Mot Halga and Mugin Bilda varieties were compared on the farm in 6 replications with strain No. 244 and late red Halga. Strain No. 241 gave the highest yield. Among the white kernelled varieties, Mugin Bilda did better than others. Selection in this variety is under consideration. It was observed during the year that a very large area was damaged by floods along the coast and that some plants of coarse "Kagga" paddy resisted these floods. The seed of 200 resistant plants has been collected separately with a view to study whether the resistance is an inherent character. This will be done during the next season.

(23) *Experiments on Sugarcane in Kumpta Farm.*—Four varieties of cane, viz. Co. 281, Co. 290, Co. 312 and H.M. 87 were compared with Red Mauritius in four replications according to Fisher's method. Red Mauritius was found to yield higher tonnage than others. With a view to see whether cane could be grown on Mal land without water, seedlings of 3 Co. varieties were raised in seed beds and were transplanted in Mal lands. No irrigation was given to the crop after transplanting. Co. 312 gave a fairly good outturn of 3,000 lbs. of liquid gul per acre and there was a net profit of Rs. 25 per acre.

(24) *Experiments on Betel-nut, Cocoanut and Mango Trees.*—In the fertilizer experiment on betel-nut conducted in a cultivator's field near the farm, it was observed again during the year under report that bone meal in combination with undi cake brings about the highest yield. With low price for areca nut however, none of the fertilisers was found paying. The cultivation of cocoanut as a dry crop on Kumpta farm was continued and the growth of the trees continued to be satisfactory. A few trees have begun to bear and records of yields are being kept. Mango trees were treated with bone meal, calcium carbonate and common salt, singly and in combination with others, for their bearing. The application of common salt stimulated the plants to put forth flowering shoots to a considerable extent. Other chemicals do not seem to be efficacious. Tobacco, queen pine apple continued to be paying crops on Mal lands for Kanara conditions.

(25) *Gadag Seed Farm.*—The quantity of selfed seed in the first generation and that raised from selfed seed in the second generation on Gadag farm during the year were 340 lbs. and 6,000 lbs. respectively.

These quantities were quite sufficient for the requirements of the Gadag Seed Multiplication Scheme. The yield of cotton on an average was 427 lbs. per acre on this farm. Jowar grown in rotation to cotton suffered from excess of moisture and wheat from rust.

(26) The Cotton Breeder compared different American cottons here on this farm and Negloor-Dharwar-American gave higher yield (600 lbs. per acre) than others. He also tried Jayawant, K.W.R. × 15 and Dharwar 1 × Dharwar 2, strain 1–0–1 on this farm. The yield of Dharwar 1 × Dharwar 2 strain 1–0–1 and K.W.R. × 15 were higher than that of Jayawant. The yields of Herbaceum cottons were higher than those of American cottons during this year of heavy rainfall.

(27) *Tegur Cattle Breeding Farm.*—The progeny of the cross between local cows and Amratmahal bull has continued to show marked improvement. The performance of the bull has continued to be good. Eight bull calves and eight cow calves were born during the year and almost all of them resemble pure Amratmahal calves. The total number of the herd on 31st March 1934 was 132 against 140 last year. Four bull calves were sold during the year and five old cows were sent to Panjarpol. The bull calves sold in the previous years for draught purpose are doing exceedingly well and have attracted the attention of the cultivators to a great extent in Mallad. The performance of the bulls given out for breeding purpose last year is not so satisfactory and a type is yet to be fixed for the purpose. Results of crossing local sheep with Merino ram have continued to be fairly good. Hay and silage were prepared on the farm as usual and jowar and kulthi were grown both for fodder and grain. A well was constructed at a cheap cost of Rs. 150 during the year from savings effected under other heads of the farm and lucerne is being grown to a certain extent under the same. The expenditure per head of cattle was Rs. 17 against Rs. 16 of last year.

(28) *Experiments in Cultivators' Fields.*—The District staff continued to conduct experiments in cultivators' fields as usual. With a view to meet the doubt of the cultivators, Jayawant cotton was compared with local Kumpta in 46 places in various kinds of soils in Navalgund and Haveri talukas of the Dharwar District, in Bailhongal and Athani talukas of the Belgaum District, and in Bagalkot and Bijapur talukas of the Bijapur District. The average per acre yield of Jayawant cotton was 261 lbs. kapas or 73 lbs. lint against 250 lbs. kapas or 65 lbs. lint of local Kumpta. In almost all places Jayawant stood better than Kumpta though the crop was slightly late. If it was not overtaken by anti-monsoon rains, the yields would have been still higher. Gadag No. 1 cotton was compared with Dharwar-American cotton in 23 places in Gadag and Ron talukas of the Dharwar District. In 21 out of 23 places, the experiments were conducted in poor and karl soils to meet the wishes of the cultivators. The average per acre yield of Gadag No. 1 cotton was 172 lbs. kapas or 57 lbs. lint against 181 lbs. kapas or 50 lbs. lint of Dharwar-American cotton. In karl and poor soils Dharwar-American gave slightly more kapas than Gadag No. 1 but this kapas reduced to lint is less than that of Gadag No. 1. In good

soil, Gadag No. 1 cotton gave more kapas and more lint than Dharwar-American cotton. The demonstration of these experiments have enabled the cultivators to realise the merits of Jayawant and Gadag No. 1 cottons. Co. 2 cotton was compared with Upland under canal and well irrigation in 5 places. The average per acre yield of Co. 2 was 606 lbs. kapas against 516 lbs. of Upland. The cultivators are appreciating this cotton. The selected strains of Fulgar white variety of jowar was compared with local in 2 places. It gave higher yield than local at Aladkatti but less than local at Bailwad. Selected strains of Nandyal variety of jowar was compared with local at Dharwar and it gave 20 per cent. higher yield. Selected strains of paddy were compared with local in 56 places round Dharwar, Kalghatgi, Haveri, Khanapur, Halyal, Kumpta and Honnavar and these have given higher yields in almost all places. Pivala Kathya variety of wheat strain Nos. 103 and 808 were compared with local in four different centres of the Division. There was severe attack of rust and only strain No. 808 stood it to a certain extent. Three Maldandi strains of rabi jowar were compared with local at Honganahalli in Bijapur taluka and st. No. 35-1 has been found to be better than others including local. Three strains of Dagadi variety of rabi jowar were compared with local at Shirur in Bagalkot taluka and none of them were found superior to local. Nadiad No. 6 tobacco was compared with local in 2 places in the Belgaum District and its yields were higher than local in both places. Spanish peanut variety of groundnut strain No. 5 was compared with local in 3 new places in Badami and Chikodi talukas and the results are in favour of strain No. 5. Seed rate experiments in this variety of groundnut was conducted in 3 places and it was observed that 120 lbs. seed rate gives slightly higher yields than 80 lbs. seed rate. Pondichery variety strain No. 8 was compared with local in 2 places in Mundargi Petha of the Dharwar District and results have been very encouraging. The average yield of strain No. 8 was 804 lbs. per acre against 463 lbs. of local. The seed of this strain will be multiplied locally in Mundargi Petha. J. 213 variety of cane was compared with local Pundia at Arbhavi in Gokak Canal tract with good results. The yield of gul is 10 per cent. more. Charred bone meal was tried on paddy crop in 3 places. The higher yields of treated plots have paid the extra cost of manure and the experiments will be repeated during the next season. Sann green manuring experiment was conducted in 3 places to cotton crop and results have been encouraging. The extra yields in all places have covered the extra cost of green manuring and have yielded extra net profits. Dry farming experiments conducted at Bijapur have confirmed the inferences of last year that the value of extra yields obtained by following the dry farming methods does not cover the cost of extra operations and they do not, therefore, stand the economic test with local method. All observations and yields have been carefully recorded as usual in experimental Note books.

(b) Propaganda.

(29) *District Cotton Work.*—Multiplication and distribution of Jayawant and Gadag No. 1 cotton seeds was continued round Hubli

Athani and Gadag. The reserved areas under Jayawant in Hubli and Athani centres were 24,000 and 7,156 acres and that under Gadag No. 1 in Gadag centre was 24,619 acres. The roguing expenses ranged from 4·0 to 6·83 pies per acre. The produce was collected and sold mostly by auction. It was ginned separately under the supervision ot the District staff and the seed obtained (21,50,192 lbs. of Jayawant and 9,04,190 lbs. Gadag No. 1) has been stocked for distribution during the coming season.

(30) *Grading and Auction Sales.*—In all 7,661 dokras of Jayawant and 12;794 dokras of Gadag No. 1 cotton were graded for auction sales. The graded cotton fetched better prices than those prevailing in the market. Three auction sales were held at Hubli, two at Dharwar, and five at Gadag. Jayawant cotton received an average price of Rs. 122 per naga (1,344 lbs.) against Rs. 116 for bazar cotton at Hubli. Gadag No. 1 cotton also received an average price of Rs. 122 per naga against Rs. 115 for bazar Upland cotton.

(31) *Working of the Cotton Transport Act.*—22 check stations were established during the year under report and the District Agricultural Overseers continued to supervise the working of these though at great inconvenience to their other routine duties. Licences were issued, as usual, from Gadag, Bagalkot and Nargund offices. To avoid irregularities which took place last year in the case of imports to Gokak Mills, the work of issuing licences and checking the imports was entrusted to the licencing office at Bagalkot instead of to Gokak Mills with good results. The Cotton Transport Act is working admirably well in the interest of the growers as well as the consumers of improved varieties of cotton in the Southern Division.

(32) *General District Work.*—The grant under demonstration was very limited again during the year under report. The District Agricultural Overseers were instructed to conduct demonstrations mainly through the Taluka Development Associations and to utilise the limited funds of the Department in places where Taluka Development Associations do not exist. Demonstrations of successful standing crops of selected strains of cotton, paddy, jowar, groundnut, wheat and tobacco in experimental plots continued to receive major attention of the District staff all over the Division. 20 village demonstrations of paddy strains were conducted and cultivators of not less than 86 villages were invited to attend the same in Dharwar and Kalghatgi talukas and Mundgod Petha of one District Agricultural Overseer's division alone. Similar propaganda on the same item was done in Belgaum and Haveri divisions. Village demonstrations on selected strains of cotton were equally intensive. Besides these various crop demonstrations, sulphur dusting propaganda against smut in jowar and mango hoppers was done on a very large scale. The demonstrations of stone roller and wheat thresher were continued in Bijapur District with good results. In Gadag Division of the Dharwar District, demonstrations of groundnut-seed-drill, groundnut digger and seed seives received more attention. In all 136 demonstrations of various nature were held in the division.

Progress of departmental work through these village demonstrations continued to be very satisfactory.

(33) A big District Agricultural Show planned last year was held at Chikodi in the month of March during the year under report when various activities of the Agricultural Department were exhibited. A demonstration plot was also organised. The public Health, Co-operative and Industrial Departments also exhibited their sections. The Deputy Director had to work hard for organising this show. The Commissioner opened the show which was attended by more than 2,000 people on the first day. Other agricultural and cattle shows held in the Division were 12 in number.

(34) The rural uplift work undertaken at Kakhandiki in the Bijapur District with the aid of the donation given by a local gentleman Mr. Shivappa Arli continued to be satisfactory during the year. The Land Development Committee gave its iron ploughs on hire and got 452 acres ploughed during hot weather. The cultivators who purchased their own iron ploughs last year ploughed their lands also. The Agricultural Committee covered an area of 800 acres with Jayawant cotton. The Educational Committee recruited during the year 30 depressed class boys for the infant classes and slates and pencils were provided to them free of cost. The Sanitation Committee arranged to keep drinking water clean and destroyed prickly-pear with the aid of Cochineal insects. The breeding bull of the Saunstha has given good service and four Leg-horn cocks have been introduced in the village. The Collector and President of the Anti-famine Institute, the Assistant Collector and members of the Rural Uplift sub-committee of Institute visited this Saunstha and were pleased with the progress of its work.

(35) *Propaganda against Smut on Jowar.*—The work was continued through the District Agricultural Overseers, through the Revenue Officers and through Taluka Development Associations. The District Agricultural Overseers conducted a number of demonstrations and showed the method of treating jowar seed with sulphur dust against smut. They did also intensive propaganda in a few villages and induced all cultivators there to treat their seed before sowing. In all 10,000 packets of sulphur dust sufficient to treat the seed for 1,60,000 acres was ordered during the year. The Mamlatdars in Dharwar and Belgaum Districts were requested to sell all outstanding copper sulphate packets and take sulphur dusting packets.

(36) *Kanarese Agricultural Magazine.*—The propaganda through the Kanarese Agricultural Magazine was continued and many interesting articles were contributed by the officers of the Agricultural Department on different subjects. The Deputy Director continued to be the Chairman of the Publication Committee. Mr. Kadkol, Superintendent, Dharwar Farm, became the editor.

(c) *Organisation.*

(37) *Co-operative Cotton Sale Societies.*—The Hubli and Gadag Cotton Sale Societies continued to do good work on extensive scale. The Cotton

staff of the Agricultural Department is closely helping these two Societies in their work. These societies distributed large quantities of pure pedigree seed of improved varieties of cotton and sold cotton of these varieties brought by the cultivators. Dharwar, Bailhongal and Bijapur Cotton Sale Societies did similar work but on a smaller scale. The sales effected by different Cotton Sale Societies during the year came to 33,461 bales valued at Rs. 9,34,515. Other Sale Societies such as Nipani Tobacco Sale Society, the Sankeshwar General Sale Society and the Byadgi Chilly Sale Society continued to do fairly good work.

(38) *Other Co-operative Societies.*—The seed, implement and manure societies are not working well as they are too small to maintain an efficient staff. Cattle Breeding Societies are realising the benefits derived by crossing local cows with Amrat Mahal bulls and some of them are doing very well. The Cattle Breeding Societies at Sidenur and Chalgeri continue to deserve special mention. Benefits of Co-operative Fencing against wild pigs are recognised by the cultivators, but joint action is getting very difficult owing to the apathy of the absentee landlords. Legislation to compel the minority is absolutely necessary for substantial progress as I have repeatedly stated in my previous reports. The fencing scheme at Tegur has been completely worked out and papers have been sent to the Registrar, Co-operative Societies, for registration. The prospects of this scheme are very good as there is perennial supply of water and as there is large scope for cultivation of sugarcane.

(39) *Destruction of Prickly-pear.*—Digging and poisoning were entirely stopped and destruction with the aid of Cochineal insects was extended all over the Division including Mundargi Petha, where the work was originally started. The Taluka Development Associations, the Municipalities and the Local Boards took active interest in destroying prickly-pear with the aid of the insect. It is hoped that within the next 2 or 3 years there will be little prickly-pear to be seen in the Southern Division.

(40) *Crop Protection Campaigns.*—The campaigns against wild deer were continued at Kaujageri, Belvanki, Hadagali and Balganur and an area of 21,731 acres was protected at an expense of Rs. 278. In all 61 deer were killed and a large number was wounded and scared away. The Arwatgi Gun-club organised for hunting wild pigs referred to in paragraph 40 of the last year's report did exceedingly good work. In all, 113 pigs were killed within a short period of 5 months and many were scared away. An area of about 700 acres of paddy crop was completely protected and few cultivators had to go to watch their crop at night. Rules were framed for the guidance of the club and they were rigidly followed. Seeing the successful work of this club, the Director of Agriculture approached the Commissioner for encouraging gun-clubs on Arwatgi system all along the eastern border of the denser forest areas of Kanara, Dharwar and Belgaum districts. The Commissioner in consultation with the Collectors and the Conservator of Forests, has agreed to the proposals of the Director of Agriculture and more gun-clubs are being attempted. One in Ghalgi-Hulkop group which was already under contemplation, is now ready for starting its work.

(41) *Spraying against "Koleroga" on Betel-nut.*—I toured in Sagar and Hosanagar Talukas of the Mysore State and made observations on the extensive work of spraying that was in progress there. I put up a scheme for work in Kanara District based on Mysore organisation, but with modifications to suit Kanara conditions. A scheme for Siddapur Taluka has been approved by Government and will be in operation during the coming season. It is intended to cover 4,000 acres in 5 years. During the year under report, an area of 1,441 acres was sprayed against 800 acres of last year. A series of demonstrations and training classes were held in different places and an intensive propaganda was made to popularise spraying against Kotte-tying.

(42) *Taluka Development Associations.*—There are 15 Taluka Development Associations in the Southern Division—7 in Dharwar, 4 in Belgaum, 2 in Bijapur and 2 in Karwar District. According to the recent classification made by the Divisional Board, 5 are in A class and the other 10 are in B class. The Joint Board has given its sanction for registration of a new Association at Halyal. The total amount of subsidy given to these Associations was Rs. 7,340 during the year against Rs. 7,875 of last year. The work of these Associations continued to be good and was appreciated by the cultivators but their financial position is not yet sound. The help of the Co-operative Credit Societies in this direction seems necessary as reported last year.

(43) *Dharwar District Agricultural Association.*—This Association after its revival last year has been doing fairly good work. The Managing Committee met four times and the Publication Committee five times and discussed important matters concerning the Association, and the magazine. The Association held four conferences at Saswihalli, Chikhandigol, Madaganur and Gadag.

Wilson Anti-famine Institute—This Institute at Bijapur continued to do good work in various directions. The depots sold implements and spare parts worth Rs. 3,807. The Institute distributed 130 bags of Jayawant cotton seed and sold sulphur dust worth Rs. 323 for treatment of jowar seed against smut. The most important new activity of the Institute during the year under report was rural uplift work in nine selected centres of the District. The Institute has entertained kamgars selected by the Deputy Director of Agriculture and has placed them in different centres of the District to do village development work. The Collector and President of the Institute Mr. M. D. Bhat, I.C.S., is taking keen interest in the work of this Institute. The District Agricultural Overseer, Bijapur, continued to work as Joint Secretary and guided all technical work of the Institute.

(44) *Divisional Board.*—The Divisional Board of Agriculture held its quarterly meetings regularly and guided the work of the district officers and Taluka Development Associations. The most important subject dealt with in these meetings were (1) need of training the District staff in sugar-making, (2) organisation of gun-clubs on Arwatgi system and (3) improvement of Taluka Development Associations.

(d) Direct Services to the Public.

(45) *Field Embankment.*—As the post of the Bunding Officer was retrenched the work suffered much during the year under report. One Agricultural Overseer, who was utilised last year for bunding, had to take up tractor work during the year under report and very little bunding work could be done. It is not possible for the District staff to attend to bunding work and I must reiterate that posts of bunding officers should be revived. When demand for advice on bunding was considerably increasing and when more staff was a pressing need, the retrenchment of the existing post was a severe blow to the progressive work. Its work in the Southern Division was much appreciated by the cultivators, but its growth has now been badly crippled.

(46) *Work of the Mechanical Assistant.*—There were 9 applications during the year for plans and estimates of pumping plants, and five for plans and estimates of sugar-making machinery and all of them were dealt with. Three sugar-making plants on open pan system, one grinding and one pug-mill were erected in Belgaum District. The demonstration of sugar-making on Arbhavi farm, at Chikodi and at Mugatkhan-hubli were attractive and were much appreciated by the cultivators. One pumping plant was erected at Bijapur and repairs to seven old plants were effected at Bijápur, Kudgi, Karjol, Ukkali and Indi. Charges recovered from the cultivators amounted to Rs. 155. The Mechanical Assistant continued to be fully busy throughout the year. In addition to the above work, he attended to the repairing of the machines on Gokak and Dharwar farms and attended to demonstrations of improved seed-drill and groundnut-digger.

(47) *Karjagi Fodder Storage.*—Enquiries with Municipalities, Taluka Development Associations, Revenue Officers and Individual cultivators were made with a view to dispose of the fodder but there was no demand from any part of the Division as the season happened to be very good for the growth of all fodder crops. The actual sales amounted to 981 bales valuing Rs. 194. Only small temporary repairs were effected to the stacks. The machinery was attended to and kept in order.

(48) *Tractor Ploughing.*—The work of tractor ploughing for the removal of hariali a deep-rooted weed was continued by the Burmah Shell Co. under the guidance of the Agricultural Department which canvassed the required area at a fixed rate of Rs. 15 per acre for 10″ depth and inspected the quality of the work done. An area of 1,000 acres was canvassed at Meundi and round about in Mundargi Petha. The Burmah Shell Co. ploughed an area of 565 acres and the rest had to be rejected for various reasons. The work done for 10″ depth during the year under report was better than that done in previous years. The Burmah Shell Co. took tests on different kinds of shares and on different kinds of ploughs.

(e) *Agricultural Education.*

(49) The Vernacular Agricultural School at Devi-hosur completed its 20th year and it was continued to be managed by only one graduate Assistant. 52 applications were received for admission against 81 of last year and 15 students were admitted. Out of these 15, one left the school in the middle of the term and 14 continued their studies till the end of the year. All these 14 students of the I year and 6 of the II year received Government scholarships of Rs. 5 each per month. Results of annual examinations continued to be satisfactory. 13 students out of 14 in the I year and 8 out of 12 in the II year passed. Three in the I year and 2 in the II year stood in the 1st class. The number of past students of Devi-hosur school is 263. As reported last year, 137 students have taken to private farming. Efforts are being made to form an Association of the past students. The rules of this proposed Association have been approved by the Director of Agriculture and its work will be started during the coming year. The health of the students continued to be good. The boarding charges were moderate, the average being Rs. 7-3-6 per month against Rs. 6-14-8 of last year.

(50) Examinations of all the 20 Agricultural Bias classes were continued to be conducted by the District staff of the Department. With increasing number of these classes, the work of examining the students is also much increasing and I must reiterate that the District Local Boards should be advised to have their examining staff. A separate training school for training the teachers required for Agricultural Bias classes is also a pressing need.

(51) The publications issued by the members of the Department in the Southern Division were—(*i*) "Relative susceptibility of cotton wilt" by G. L. Kottur and S. S. Marlihalli, submitted to the Indian Science Congress, (*ii*) "Studies in disease resistance with special reference to cotton wilt" by G. L. Kottur and M. K. Desai, submitted to the Indian Science Congress, (*iii*) "Seasonal fluctuations in the Rice Plant" by T. R. Khadilkar, submitted to the Indian Science Congress, (*iv*) "A teretological phenomenon in rice infloresence" by T. R. Khadilkar (Indian Journal in Print), (*v*) "Study of co-relations of branches, flowers, pods and yield in groundnut" by S. S. Marlihalli, (*vi*) "Possibilities of extension of pomegranate cultivation in the Gokak Canal tract", by S. G. Kelkar, (*vii*) "Non-parasitism of Cochenial insects to other crops than prickly-pear" by S. G. Kelkar, (*viii*) "Cultivation of J. 213 sugarcane in the Gokak Canal tract", by G. S. Kulkarni, and (*ix*) "Sugar-making by open pan system on Gokak farm" by S. G. Kelkar.

General.

(52) A scheme for investigation of Small Leaf Disease was sanctioned by the Indian Central Cotton Committee during the year under report under the administrative control of the Deputy Director of Agriculture and technical guidance of the Plant Pathologist. A graduate Assistant and two kamgars have been appointed and the work is in progress

Enquiries about the extent of this disease were made in Karnatak and Gujarat and preliminary investigations about the nature of the disease were conducted on Dharwar Farm.

(53) The Indian Central Cotton Committee financed a scheme to enquire into village consumption of cotton and a graduate assistant was appointed for the purpose for 6 months. A taluka place and 6 villages were selected and enquiries were made. The study is completed and the report is being drafted.

(54) The 15th Divisional Conference of the officers of the Agricultural Department in the Southern Division was held at Dharwar and various subjects were discussed.

(55) The Deputy Director of Agriculture attended Crop Research Committee meeting in Poona, Railway Board meeting in Madras, Forest Committee meetings at Dharwar, Village Development Committee meetings at Belgaum, Karwar and Bijapur and Indian Central Cotton Committee meeting in Bombay. He arranged a training class for the fieldmen of Taluka Development Associations for three months when some new men were also trained. The training was given in different branches of the Departmental work and certificates were given to successful candidates in the examination.

(56) The Director of Agriculture inspected the site of the dry farm opened at Bijapur.

(57) The Honourable Divan Bahadur S. T. Kambli, B.A., LL.B., J.P., Minister for Agriculture, toured in Dharwar District twice during the year and the Deputy Director accompanied him to Arvatgi Alnavar, Halyal and Mundgod. The Honourable Minister paid a visit to Dharwar Farm also.

(58) His Excellency the Right Honourable Sir Frederick Hugh Sykes, P.C., G.C.I.E., G.B.E., K.C.B., V.M.G., the Governor of Bombay, visited Sirsi when a small agricultural show was held. His Excellency inspected spraying work against Koleroga at Tyagali and inspected Bankapur Cattle Breeding Farm.

(59) The activities of the Agricultural Department in the Southern Division continued to extend. The growing work in various directions could not be curtailed and the staff had to work with limited funds at their disposal. All the members of the staff excepting a few continued to do good work. Many Revenue Officers and private gentlemen continued to help our agricultural propaganda and organisation work, and my thanks are due to them. I must thank specially the Collectors of Belgaum, Dharwar, Bijapur and Karwar Districts who gave me all the help needed from time to time.

S. S. SALIMATH,

Deputy Director of Agriculture,
Southern Division, Dharwar.

Programme of Work under the Deputy Director of Agriculture, Southern Division, Dharwar, for 1934-35.

(1) *Cotton Breeding Work.*—Selfing of Jayawant and Gadag No. 1 cottons will be continued for multiplication of seed required for Hubli, Athani and Gadag centres. Different varieties of cotton will be tested for wilt resistance under green house and field conditions, and the most resistant strains will be isolated. Selection in Jayawant × 15, Dharwar No. 1 × Comilla, Dharwar No. 1 × M. D., D. A. Ron × Co. 2, D. A. Ron × Gadag No. 1 and Gadag No. 1 × Co. 2 will be continued.

(2) *Jowar Breeding Work.*—Fulgar yellow, Fulgar white, Nandyal, Bilichigan and Savaner selected strains of jowar will be maintained by selfing and grown on the Dharwar farm to meet the needs of the cultivators.

(3) *Groundnut Breeding.*—Spanish peanut variety of groundnut strain No. 5, Pondichery variety strain No. 8 will be grown on the farm to produce seed for distribution in the District. Selection in other promising varieties will be continued.

(4) *General Experiments on the Dharwar Farm.*—All the important varietal manurial and rotational experiments will be continued. Poultry breeding will also be continued.

(5) *General Experiments on Gokak Farm.*—Under Crop Experiments sugarcane, cotton and tobacco varieties will continue to be compared. Some new early varieties of cane will be added. Under Manurial Experiments, artificial manures on sugarcane will be repeated. Selection in maize and fruit gardening will continue to receive increased attention.

(6) *Rice Breeding Work.*—Selected strains of Mugad and Antersal varieties of paddy will continue to be multiplied on Mugad farm. Selection in Dodaga variety of paddy will continue to receive major attention. Selection in local fine rices will be taken up. Imported foreign and Indian high yielding varieties of paddy will be compared with local. Botanical study and grain shedding character will be pursued in gonag and cultivated rice and a cross will be made between the two. Observations on hulling character will be made.

(7) *Experiments on Cultivators' Field.*—Selected strains of cotton, jowar, paddy, tobacco, wheat, sugarcane and groundnut will be compared with local in suitable places of the Division. Sulphate of ammonia and bone meal will be tested on sugarcane and paddy crops. Dry farming experiments will be discontinued as a separate farm has been established for the purpose.

Propaganda.

(8) Demonstrations of improved implements especially wheat thresher, stone roller, groundnut-digger and improved seed drill and those of successful crop experiments in Government farms and in cultivators' fields will continue to be held as usual. Spread of Jayawant and Gadag No. 1 cottons will continue to receive greater attention. All check

stations will be inspected and attempts will be made to stop illicit import of inferior cotton into the protected areas of the Southern Division. Spanish peanut and Pondichery selected strains of groundnut will be multiplied and distributed in various parts of the Division. The cultivation of Nadiad No. 6 variety of tobacco will be extended in Chikodi taluka and that of maize and tur and maize and cotton in the Gokak Canal tract. Bunding and fencing works will receive as much attention as possible. Agricultural shows and conferences will be held only in a few places where there is genuine demand for the same. Village Officers will continue to receive instructions at the time of Jamabandi meetings and demonstrations. The rural uplift work at Kakhandki and other villages will continue to receive due attention.

Organisation.

(9) Our close work with Hubli and Gadag Sale Societies will be continued. The seed multiplication schemes will be revived. Pig proof wire fence will be erected round Tegur fields and more fencing schemes will be attempted. Destruction of prickly-pear will be extended through all local bodies. Crop protection campaigns against deer will be continued in Gadag and Ron talukas. Gun clubs of the Aravatgi system for hunting wild pigs will be started in about half a dozen centres.

The existing taluka developments Associations will be guided to work according to the programmes drawn for them and a new Association at Halyal sanctioned by the Joint Board of Agriculture will be started. The Dharwar District Agricultural Association and Bijapur Wilson Anti-famine Institute will continue to receive the usual close guidance.

(10) The work of spraying against Koleroga on betel nut will be extended with the scheme sanctioned by Government.

S. S. SALIMATH,
Deputy Director of Agriculture,
Southern Division, Dharwar.

APPENDIX F.

Summary of Work done under the Deputy Director of Agriculture, Gujarat, Surat, for the Year 1933-34.

I—Staff.

I was in charge of the Division throughout the year excepting for five weeks when I was on leave and Mr. G. P. Pathak officiated.

2. Mr. G. P. Pathak was the officiating Cotton Superintendent except for five weeks when Mr. H. M. Desai acted for him.

3. Mr. D. P. Mankad, Cotton Breeder, Viramgam retired on 9th January 1934. Mr. Mankad had his training in agriculture at the Agricultural College, Saidapet, Madras, as early as 1897-1900 and after sometime he was appointed in revenue Department at Broach and later on was transferred to the Bombay Agricultural department in 1904 as an Assistant Entomologist. After serving for few years as a Clerk in Sind and at the Agricultural College, Poona, he was appointed as a senior fieldman under Imperial Cotton Specialist at Poona in 1908 where he had very good opportunity to study cotton all over India. From 1919 to 1921 he acted as Cotton Specialist. In view of his cotton work under the Imperial Cotton Specialist and after, he was selected as Cotton Breeder, North Gujarat, Viramgam. Though it was a work of different nature he successfully adapted himself to the new duties. He was specially good in administrative duties and had a personality of his own.

Mr. G. B. Patel, who was appointed as Cotton Breeder, Broach, under Indian Central Cotton Committee has been appointed permanently as Cotton Breeder, North Gujarat, Viramgam, and has proceeded on long leave to specialise in genetics at California University under Dr. Babcock with the study scholarship awarded by the Indian Central Cotton Committee. Mr. V. M. Majmudar is acting as Cotton Breeder, North Gujarat, Viramgam.

II—Season.

4. May rains were useful for preparing land. The monsoon started on 19th to 21st of June. Crops were sown at the end of June. July started dry with good rains in second half. Crops suffered from drought and katra.

August rained heavily and continuously which checked the growth of all kharif crops.

September was wet for first 3 weeks, rest being dry.

October had heavy rain in Broach and light showers elsewhere. Crops like bajri and maize suffered at seed formation and harvesting. Rice and nagli fared well. Tobacco seedlings suffered and had to be planted late.

November-December were milder. January was extremely cold and frosty in Ahmedabad, Kaira and Panch Mahals, where cotton and tur suffered heavily and due to extreme cold in Surat and Broach, cotton matured earlier by a fortnight. February and March gave good dewfall which helped opening of cotton bolls.

Heavy September rains gave good moisture for rabi tracts but wheat and gram suffered from warm November-December and from frosty January. Lang in Broach suffered heavily from caterpillar pest.

III—Research and Experimental Work.

(1) Crop Breeding.

Surat.

5. *Cotton.*—Four types were tested in 10 randomised replications, the area of each sub-plot being about 1·1 guntha.

The results show that selection 43 yielded highest seed cotton increase being 1·9 per cent. more than the yield of I A.L.B., and 3·5 per cent. more than that of 1027 A.L.F. In lint yield I A.L.B. yielded best. This year ginning of all cottons is lower by 2 to 3 per cent. whilst the staple is better particularly in 1027 A.L.F. and I A.L.B., selection 43 being inferior in staple length and feel to 1027 A.L.F. This year I A.L.B., selection 43 and 1027 A.L.F. are considered suitable to spin 33s, 34s and 37s respectively. White flower has spun 30s. Besides yarn is nappier compared with that of 1027 A.L.F. In yield white flower is equal to 1027 A.L.F. but lower in ginning percentage therefore it will be dropped from further trials.

6. *Crosses.*—Out of the 1027 A.L.F. crosses one culture viz., 1027 A.L.F. cross 8^1 comes equal to 1027 A.L.F. in staple length and fineness is promising.

7. *Seed production*—Self-seed was produced for seed farm. Investigations to economise selfed seed of cotton.—In this tract six to seven seeds are required to be dibbled at one place on ridges to get good germination in June-July. However to save seeds at the suggestion of the Deputy Director of Agriculture, Gujarat, two seeds were dropped at different depths after making round holes in August in 1932-33 and it was found that one inch depth gave good results. This was confirmed in 1933-34. August sowing however may give less yield in some years. It is to be tried on a large scale during next season.

8. *Jowar.*—Budh-perio 53 and Bardoli local selection were tested in 10 replications by students' method, the area of each sub-plot being 0·97 guntha. Budh-perio 53 yielded significantly better than Bardoli local selection by 26 per cent. Bardoli seed was bigger and had more yellow colour than that of Budh-perio 53.

Selfed seed of Budh-perio 53 was produced for the seed farm.

Broach.

9. *Cotton.*—This is the second season of cotton work at Broach.

Crosses.—(1) 80 healthy plants from B.D. 8 crosses with Goghari types have been selected to raise F_4 generation. Most of these were more resistant to wilt.

(2) 10 healthy plants from F_2 crosses of B.D. 8 with N.S. 10 have been selected.

(3) There were some two other crosses in F_1.

(4) Fresh crosses of B.D. 8 with Wagad, Wagad × 1027 strains and 1027 have been made as Wagad cotton is better than goghari and has high ginning.

10. *Composite Crosses.*—These are not promising but two best plants are to be tried.

11. *Selections.*—S. 10 is not yet pure and 10 best plants have been selected for further trial.

No. S. 12 has better fibre and has proved uniform for greater resistance. Five cultures have been retained for further study.

Out of 100 fresh selections none proved wilt resistant. Wilt varied from 11 to 100 per cent. 50 healthy plants have been selected for further study.

12. *Seasonal Wilt Incidence.*—This season was a high wilt season as compared with last year. Soil temperature was low due to more even distribution of rains and severe cold in January. This facilitated selection work for wilt resistance.

13. *Pathological Work.*—Object of this work is to have a homozygous wilt resistant race of cotton. 130 plants of B.D. 8 have withstood severe wilt conditions in pots and their progeny will be tested again in severe wilt conditions in pots. Moisture conditions for maximum wilt incidence is being worked out.

14. *Rabi Jowar Breeding.*—Out of 8 selections made in 1931-32 only No. 222 seems to be promising and is to be tested with No. 8 for yield and quality. Further selection is to be continued.

Replication Tests.—No. 8 was compared with local in five replications and first time out of last 5 years it yielded significantly lower than local, the difference being 11 per cent. in grains, fodder yield being equal.

15. *Wheat.*—Selections made from hard white and hard red were grown for study but the grass-hoppers cut up and destroyed the seedlings, the second sowing received the same damage. Some selections that were saved have been retained for further work.

Nadiad.

16. *Tobacco.*—Replication trials on dry tobacco were not taken.

17. *Replication Trials under Irrigation.*—Piliu 28 and 45 were tried in 4 replications of 1·1 guntha each. None of the two is significantly superior to the other, though Piliu 28 yielded better.

N-1-5 was compared with Gandiu 6 in 5 replications but the results were spoiled by frost. However it is now learnt that N-1-5 is not yet ready for yield test as preliminary quality test for local use is not taken besides it has poor seedling capacity.

N-10-3-1 a cigarette tobacco was compared with Adcock in four replications on 1·32 gunthas each. N-10-3-1 being a late type has yielded 40 to 50 per cent. more than Adcock which is an early type and the increase is significant. However real financial comparison with Gandiu 6 a local type which it is going to replace is yet to be studied. Final yield of N-10-3-1 per acre into different grades and the price realisable for the flue cured tobacco of different grades has to be ascertained.

18. *Pure hybrids of some value.*—N-10-7-5 and N-10-7-6 are two more cultures that are practically pure. N-10-7-5 is likely to be bit stronger in flavour than N-10-3-1 and N-10-7-6 is dwarfer plant and has broader leaf.

19. *Growing of Cigarette Tobacco.*—Nipping of plant at 20 leaves gives desired leaf. No further trials have been taken.

20. *Flue Curing.*—A small flue curing barn was designed and planned by Dr. M. S. Patel, the Industrial Chemist of the Industrial Department in consultation with the staff of the Department. The barn has worked successfully and Dr. Patel has promised to work up some other items regarding the final stage of the curing which remained undone for want of funds during the year.

This barn was successfully used to cure tobacco at Nadiad by Mr. S. G. Bhalerao, Tobacco Breeder, Nadiad, who got special training at Pusa in February 1933 and the flue cured tobacco is found superior to rack cured tobacco in colour, flavour and burning quality, the quality being as good as that of Madras flue cured tobacco. One of the Bombay manufacturers of cigarette has offered annas 8 to 10 per lb. for such sample. This result however is to be confirmed by another trial to be sure of the final result. However looking ahead the spread of cigarette tobacco is likely to be seriously handicapped by the increase of the *orobanche* parasite in the tract.

21. *Bajri.*—One hundred and fifty ear-heads representing 35 original cultures were selected for study. Out of these 10 selections were studied more intensively and they have shown higher purity. Seven cultures of these with local were tested first time in six random replications, the area of a plot being 0·25 guntha. Three of these viz., 128, 206 and 207 are superior to local by 14, 15 and 33 per cent. in grain yield and 5, 15 and 31 per cent. in fodder yield respectively. However 207 alone is significantly superior to local in grain yield only. This type has long and thick ear-head.

22. *Castor Work.*—Four cultures viz., S-2, S-5, S-20 and S-9A were tested with Kaira and Prantij locals in six latin squares under two spacings viz., 4′ × 4′ and 4′ × 2′, the area of each plot being 1·85 gunthas.

S-2 is rejected as it has no more oil content. The remaining strains have higher oil content than the locals.

S-20 does well under wide as well as narrow spacings. It is intermediate in period of growth and may suit kharif and semi-rabi tracts.

S-9A is an early type and does well under narrow spacing and so specially suitable for rabi and semi-rabi tracts.

S-5 is latest of all and may suit wider spacing as a kharif crop.

Seed of S-20 and S-5 are to be multiplied at Nadiad and of S-9A at Jalgaon. These are also to be tried in cultivators' fields.

Viramgam (Ahmedabad District).

23. *Cotton.*—Six cultures of the cross Wagad 8 × 1027 A.L.F. (five of last year with a new culture 4-1) with one new selection F.S-26-2 were tested with local Wagad and Wagad 8 in 5 random replications, each plot being 1·93 gunthas.

Results show that Wagad 8 ginned higher than local by about 3 per cent. and all the hybrids ginned higher by about 2 to 6 per cent. and selection F.S-26-2 ginned higher by 1 per cent. than Wagad 8.

During the season all the cottons suffered from water-logging in varying degrees, Wagad 8 suffering the least ; while local Wagad and F.S-26-2 suffering the most. In yield of kalas and seed cotton local Wagad F.S.-26-2 are about equal but much below the yield of Wagad 8.

Local Wagad, F.S-26-2 and 12-2 are significantly inferior to Wagad 8 in yield of kalas and seed cotton whilst 4-1, 13-11 yield little less and 13-8, 13-12 and 13-13 yield still less compared with Wagad 8 but these differences in yield are not significant.

13-11 has highest ginning and in lint yield it is significantly superior to Wagad 8. However it is hardly advisable to go in for much higher ginning than Wagad 8 considering that we need better spinning cottons and we should see that our difficulties may not increase by selecting higher ginning cotton which may not spin better.

24. *Jowar.*—Out of the six selections of Chhasatio under study five green and mid ribbed were selected and five Utavli selections were grown in duplicate plots of 0·87 guntha each for preliminary yield tests. Three rows 18" apart were drilled under each variety. Seed rate per acre was 23 lbs. Five selections viz., G-8-2, G-10-2 from Chhasatio and G-11-4, W-8-1 and W-3-4 from Utavli are selected for growing on large scale in comparison with local type.

25. *Cotton Technological Assistant and his Work.*—The Indian Central Cotton Committee has provided funds to maintain Cotton Technological Assistant and his laboratory since February 1931-32.

The Technological Assistant is stationed at Surat and he tests fibre properties of cottons for Viramgam, Broach and Surat Cotton Breeding Stations to help the Breeders to select the best plant for further study.

The Technological Assistant examines a number of samples on the spot for length, feel and strength of cotton fibres of individual plants before he makes final selection for thorough laboratory tests. Thus 86, 130 and 105 samples have been or are being tested forthe last three seasons respectively. As a result of this study Cotton Breeders are able to

reject undesirable plants at an earlier stage which saves lot of time and money.

Goghari type has been found to have weak and immature fibres and the weakness and immaturity is inherited which makes the type unsuitable for crossing purposes.

(2) Experimental Station Work.

(*a*) *Surat Agricultural Station.*

26. *Seed Multiplication.*—Cotton 1027 A.L.F. was grown on 52 acres and 27 gunthas giving 707 lbs. of seed cotton per acre, which is the highest recorded yield on the farm. 21,945 lbs. of resultant seed was distributed in the selected villages of the Surat seed groups for further multiplication and distribution.

27. Jowar Budh-perio 53 was grown on 56 acres and 26 gunthas giving 1,196 lbs. of grain per acre. 18,000 lbs. of seed was distributed.

28. *High* vs. *low Ridges.*—The experiment was carried out as described in paragraph 34 of the last year's report. The farm yard manure at the rate of 10 cart-loads per acre was given to cotton. There was practically no difference in the germination as the sowing season was specially favourable. There is no significant variation in yield between different methods.

29. *Manurial Experiments.*—Sulphate of ammonia—The experiment reported last year in paragraph 35 was carried out. The percentage increase in yield over the control (i.e. no manure) was as under :—

	Treatments.	Percentage increase over control.
1.	40 lbs. nitrogen	45·4
2.	40 lbs. nitrogen at sowing ..	41·07
3.	20 lbs. nitrogen after stand ..	36·1
4.	10,000 lbs. of farm yard manure once in six years.	30·9
5.	10 lbs. nitrogen after stand ..	27·0
6.	20 lbs. nitrogen at sowing ..	21·0
7.	10 lbs. nitrogen at sowing ..	15·4

(*a*) None of the nitrogen treatments gives significantly higher yield than the first year application of farm yard manure.

(*b*) 40 lbs. nitrogen given both ways, 20 lbs. nitrogen after stand and farm yard manure show significantly higher yield than no manure.

(*c*) The treatments of 40 lbs. nitrogen after stand alone shows significant increase over 10 lbs. nitrogen at sowing.

(*d*) Nitrogen application after stand gives better results.

(*e*) Applications of 10, 20 and 40 lbs. nitrogen at sowing give an increase in yield of 17·8 lbs. 11·9 lbs., and 7·5 lbs. respectively per lb. of nirtrogen applied. Higher amount gives less increase in yield therefore application of 10 and 20 lbs. nitrogen seems to give the best results economically.

(*f*) During the year August and September rains were heavy and therefore all applications of nitrogen manure after stand have given better results compared with last year's.

(*g*) It may be mentioned that during the season very heavy rains of August and September did not allow cotton plants to grow and whatever manure was left in the soil seems to be utilized for boll formation; whilst in the previous year plants grew better in August and September due to light rains and some of the manure remained unused at boll formation stage as the residual effect on next jowar shows.

30. The residual effects of the manurial treatments to cotton on next jowar crop :—

Application of 40 lbs. of nitrogen after stand shows significant increase in grain as well as fodder over all other treatments except 20 lbs. nitrogen applied after stand. Evidently nitrogen applied last year after stand was not all utilized by the cotton crop, as September rains were light and surplus manures did not get washed down.

31. *Spacing experiment.*—The experiment reported last year in paragraph 36 was continued and the results are as under :—

Treatment.	Dibbling.	Drilling.
	(Yield in lbs. per acre.)	
3′ × 3′	687·63	724·62
4′ × 3′	696·16	684·72
4′ × 2′	745·52	770·13
5′ × 2′	824·31	753·77
6′ × 2′	736·58	726·00

Dibbling 5′ × 2′ gives best yield; whilst drilling 4′ × 2′ gives the second best result, though dibbling 5′ × 2′ alone gives significant increase over drilling 4′ × 3′.

32. *Residual effects of wider spacing of cotton.*—6′ × 2′ dibbling gives significantly better yield of jowar grain next year than 3′ × 3′ dibbling and drilling and 4′ × 3′ dibbling and 6′ × 2′ drilling of cotton, even though 6′ × 2′ cotton dibbling gave highest yield of cotton last year. This shows wider spacing improves fertility of land.

33. *Jowar spacing and its effects on fodder and grain.*—The experiment was continued as reported last year. The results are not significant for grain and fodder like last year. Grains of wider spacing were a little bigger in size.

34. *Miscellaneous trial—Dhaincha or Ikad green manuring.*—The preliminary experiment referred to in the last year's report was carried out. The season was unfavourable for germination as well as for the growth of dhaincha, thus the green stuff buried in was little more than half of that of the last year except in the poudrette application where it

was nearly three-fourth in quantity. Green manuring has increased the yield of next crop of jowar and may help to maintain fertility.

35. *Normal sowing, late sowing and green manuring.*—A new experiment both with cotton and jowar was started to see if cotton and jowar can profitably be grown late in the season with a view to have green manuring. Thus the treatments were (1) Normal sowing without green manuring, (2) Late sowing after green manuring and (3) Late sowing without green manuring. About 2 tons of green matter was buried as green manure before cotton and 3 tons before jowar. Seed rate of dhaincha being 64 lbs. an acre. The plots were duplicate, the area being 5 gunthas. Cotton was dibbled 4′ × 2′ and jowar was drilled 3′. The results show that the late sowing increased the yield of kapas materially; while there was no difference in yield due to green manuring. In the case of jowar, the grain yield was practically not affected: while the fodder yield was much affected though quality was better. Residual effects are to be watched.

36. *Surat Dairy.*—The strength of the herd on 1st April 1934 was 95 as against 82 of last year. The health of the herd remained quite good.

Nine Breeding bulls including one left on hand last year have been issued as premium bulls during the year.

One premium bull from those issued last year was returned being found unsuitable; but it was re-issued in exchange of one died in Bardoli taluka.

The milk production and realization from the sale of the Dairy produce during 1932–33 and 1933–34 were as under :—

Year.	Total milk in lbs.	Average number of adult cows for the year.	Annual average per cow in lbs.	Total realization.	Average rate in lbs. per rupee.
				Rs.	
1932–33 ..	85,522	32·0	2,672	6,584	12·99
1933–34 ..	99,434	31·3	3,156	7,071	14·06

(*b*) *Broach Farm.*

37. *Manurial experiments with cotton.*—The experiment has been shifted on new soil as the old plot has been given up as lease expired. On the new site the doze of farm yard manure has been reduced to 4 cart-loads once in every two years to plot " A " instead of 8 as this is more near the prevalent practice in the tract. The rest of the plan of experiment remained as it was.

The sann seed rate is not properly worked out as for one foot strip between every six feet the seed used is 80 to 100 lbs., which comes to 500 lbs. an acre which requires to be adjusted. Perhaps this very high

seed rate is a waste as many seeds may not germinate due to improper sowing or overcrowding may be the result. Observations on this point are essential. The actual amount of green matter added per acre comes to about 1,000 lbs., which is far too little. Sulphate of ammonia was applied with sowing one foot away from the line of plants which is too far to be of use to the young seedlings. This shows mechanical working of any plan cannot evolve out a new method that may be practical and useful. However the results of the year shows that the application of farm yard manure and 10 lbs. nitrogen as sulphate of ammonia per acre have given about 11 per cent. more yield and both are significantly superior to only sann manuring treatment.

38. *Green manuring before sowing Rabi-jowar.*—Sann was sown on 21st June 1933 seed rate being 152 lbs. per acre and it was buried on 18th August 1933 the green matter added per acre being about 2,000 lbs. The low yield is probably due to a long drought at the start of monsoon. Jowar grown after sann treatment gave less grain yield but the difference was not significant. It was tried by students' method in five replications each plot being 2·1 gunthas.

39. *Trial of groundnut on black soils.*—Farm Superintendent was asked to try spanish peanut as a crop in cotton rotation on black soils as it improves the yield of cotton and gives a kharif cash crop. Spanish peanut was tried but the seed rate used was 90 lbs. of pods instead of 90 lbs. of kernels and sowing was 22" apart and the yield comes to 471 lbs. an acre. Harvesting during the year was by uprooting and was simple. However lot of women labour was used in hand picking pods from the creepers which may be done cheaply by threshing when creepers dry.

(c) *Dohad Farm.*

40. The seed supplied from the farm was as under :—

	Lbs.
Maize	4,343
Spanish peanut	1,597
Pusa 4 wheat	9,067
Baxi wheat	123
Yellow gram	2,493
Jirasal rice	400
Anklo rice	164

Seed drill training class was attended by about a hundred Bhil farmers.

IV—Propaganda.

Ahmedabad District.

41. *Trials in cultivators' fields.*—Wagad 8 was tried in 19 fields in three new centres but only 9 plots gave some yield, rest failed due to heavy rains or frost or both.

At Patadi Wagad 8 gave better yield in one case and in other three cases gave equal yield with local but ginning was better in all cases by 3 to 4 per cent.

At Mandal centre the ginning was same in Wagad 8 and local, but Wagad 8 yielded little more.

At Wagad ginning and yield were slightly more or less in two trials. At Mandal and Wagad frost effects were uneven on the plot and the results are not so reliable. Further trials will be made.

42. *Trial of groundnut.*—Spanish peanut was tried at Tagadi, seed rate was too little yet yield comes to 400 lbs. an acre but there was very bad attack of wilt.

43. *Seed multiplications.*—During the season selfed seed of Wagad sufficient for 25 acres was obtained from Viramgam farm but due to excessive rains most of it was lost and an area of 13 acres was re-sown which gave only 1,400 lbs. of seed. The resultant seed grown by registered seed growers near Chorvadodra failed due to frost.

Problem of seed multiplication for this tract is complicated as kalas are sold by farmers but the factors of excessive rains, drought and frost make it more complicated and unless we get 3 or 4 good seasons to multiply sufficient seed to supply the tract the seed scheme is likely to get a set back at any time like this year.

44. *Wheat.*—No. 224 has extended in Bhal tract to the extent of 2,370 acres and to 50 acres in Viramgam.

No. 808 was compared with 224 and the yield is similar. 809 also compared with local but the yield is variable, so further trials are required.

45. *Sugarcane.*—Co. 213 has given 20 tons of cane per acre as first ratoon and it is watched as second ratoon near Dholka where it is grown on well irrigation.

46. 1,000 lbs. of rabi jowar seed from Broach was tried in Bhal tract and it grew better than Sholapuri type but the presence of prussic acid poison makes it unsuitable for the tract where there are no hedges.

47. *Manurial trials.*—Application of sulphate of ammonia at the rate of 112 lbs. per acre to paddy crop in addition to farm yard manure has given better results than cake manure. It increases the yield by 18 to 22 per cent.

Application of 56 lbs. of sulphate of ammonia and 40 lbs. of superphosphate did not give any advantage for wheat crop, even though it was applied a month before sowing.

48. *Trial of wheat threshers.*—As a result of a number of trials of various wheat threshers taken in Bhal tract for the last three seasons a number of practical suggestions were made by the Inspector of Agriculture, Ahmedabad, and the District Agricultural Overseer, Dholka,

for preparing a modified thresher that would give better work than Olpad thresher and Norag and be cheap. The Agricultural Engineer to Government of Bombay, Poona, was requested to see these trials and the Gujarat staff discussed the whole subject with the Agricultural Engineer and his staff, and as a result Agricultural Engineer has designed two threshers called Gujarat No. 1 and Gujarat No. 2 which were tried along with others during the season and the results are given below :—

Name of the machine.	Description.	Remarks. Work done by each in 9 hours with 2 men and 2 bullocks
Jenkins' Clod-crusher ..	Had 32 discs of 12″ diameter in 3 rows, serration $\frac{1}{8}$″ deep.	6,685 lbs. of wheat grain.
Gujarat No. 1 ..	Had 12 discs of 18″ diameter, serration 1″ deep.	7,775 lbs. of wheat grain.
Gujarat No. 2 ..	Had 12 discs of 18″ diameter, serration $\frac{1}{8}$″ deep.	5,520 lbs. of wheat grain.
Sind Norag ..	19 discs of 20″ diameter ..	4,725 lbs. of wheat grain.
Cawnpore Norag ..	Do. ..	4,119 lbs. of wheat grain.
Olpad thresher ..	9 discs of 18″ diameter, serration $\frac{1}{4}$″ deep.	Not tried this year was inferior to Norag in past trials.
Cart and bullock method—10 bullocks and 3 men.	....	3,529 lbs. of wheat grain.

Jenkins' Clod-crusher and country cart had the highest draft, Gujarat Nos. 1 and 2 had medium draft, and Olpad had the least draft. Everything now depends upon the cost of the machine to make it useful to cultivators.

49. *Cultural trials.*—Wider sowing of cotton at Tagadi was tried in cultivators' fields but interculturing was not adopted to suit wider sowing and the crop had many gaps. Early-sown crop in Viramgam was damaged and people could not be persuaded to sow wider as late crop. About 760 acres of cotton is being dibbled at two centres. However more intensive efforts are needed to push wider sowing.

50. *Demonstrations.*—27 crop demonstrations were held to demonstrate improved crops like Wagad 8 and 224 wheat, Co. 213, Sulphur treatment of jowar and use of Cotton Plant Pullers.

51. *Distribution of manures.*—The Imperial Chemical Industries Co. opened two shops one at Aslali and the other at Navagam rice centres for sale of sulphate of ammonia. Total sale of sulphate of ammonia in the district was 58 tons.

52. *Seed distribution.*—Seeds of Wagad 8 and ordinary cotton seed of Broach and Sholapuri jowar, wheat seed of 224 and sugarcane Co. 213 and suran sets, chikoo and mosambi plants, basrai banana suckers and parwar plants were supplied through the department.

53. *Pest.*—605 sulphur packets were sold to control jowar smut.

Panch Mahals District.

54. *Trials in cultivators' fields—Cultural trials.*—Wheat was drilled 15" apart in comparison with 11" apart sowing by a plough. Wider sowing gave 18 per cent. better yield on an average of six plots. Maize was also drilled 2' apart as against 1 foot apart sowing by a plough but Katra and heavy rains spoiled the crop.

55. *Manurial trials.*—Application of sulphate of ammonia at the rate of 112 lbs. an acre to the rain and irrigated rice increased the yield of rain rice by 29 per cent. and irrigated rice by 45 per cent.

56 lbs. of sulphate of ammonia per acre when applied to bajri and bavto gave an increase of 36 and 19 per cent. respectively in grain yield.

56. *Sugarcane.*—Co. 213 is spreading—one merchant put up crushing and sugar-making plant of open pan type and crushed about 23,000 maunds of cane paying Rs. 15 to 18 per 100 maunds of 40 lbs. each. He realised 6 per cent. of good sugar and is reported to be satisfied with the result.

Gul-making was also improved by introducing better furnace and boiling pan and by expert advice in *gul* boiling. Prices of *gul* were also favourable and the sugarcane crop is considered profitable and is extending. Planting cane in furrows 3' apart and application of groundnut cake and use of sann green manuring are being introduced to increase yield. Keeping ratoons with bad cultivation and no manuring is being discouraged as it brings pests.

57. *Demonstrations.*—About 10 demonstrations were arranged in Dohad taluka showing use of light iron ploughs and harrows and sowing of maize by a drill. At 8 places seed drill classes were held. Control of sugarcane borer and wider planting of cane were demonstrated in Kalol taluka.

58. *Distribution of seeds and manures.*—

Maize seed	.. ..	30,743 lbs.
Spanish peanut	.. ..	9,734 „
Wheat Pusa 4	.. ..	19,850 „
Yellow gram	.. ..	17,168 „
Sann seed	.. ..	7,680 „
Paddy	.. ..	564 „
Sulphate of ammonia	.. ..	19 tons.
Groundnut cake	.. ..	300 mds.
Sultan crushers	.. ..	18 Nos.
Poona *gul*-pans	.. ..	13 „

59. *Pest and diseases.*—178 sulphur packets to control jowar smut in Halol and Kalol talukas and 160 arsenic packets against field rats at Garbada centres were used.

Kaira District.

60. *Trials in cultivators' fields.*—Wider sowing 18" apart against 12" local with the cereal crops like bajri, kodra and bavto mixture, etc., to

an extent of about 60 bighas was carried out by the cultivators in three villages of Matar and Nadiad talukas.

61. *Manurial trials.*—56 lbs. sulphate of ammonia per acre was used for bajri, bavto and kodra mixture at the different centres in the district. Bajri yield was increased from 5 to 20 per cent., kodra 16 per cent. and bavto 5 to 25 per cent. 112 lbs. sulphate of ammonia was tried on dry and irrigated rice. Increase due to manure was 9 per cent. in case of dry and 12 to 13 per cent. in case of irrigated rice. This year's results are not so good as that of last year.

62. *Seed distribution.*—42 lbs. of tobacco Gandiu No. 6 and 12½ lbs. of Piliu No. 28 and 60 lbs. of Keliu were distributed in the district through the Taluka Development Associations.

63. *Sulphur dusting against jiru mildew.*—Sulphur dusting against jiru mildew was carried out in 9 villages of the district. In all 46 bighas were dusted on payment. During the year attack of mildew was negligible on the whole.

64. *Horticultural propaganda and service.*—The following fruit trees and grafts were supplied through the agency of the department :—

Mosambi	1,100	plants.
Chikoo	123	„
Mango grafts	98	„
Grapes	265	„
Guava grafts	51	„
Guava seedlings	1,510	
Pomegranates	350	plants.
Plantain suckers	21,100	
Figs	3,600	cuttings.
Rozes	2,400	„
Papaya seed	24	ozs.
Guava seed	40	„

Indents for 13,840 lbs. of denatured salt has been received to date from the mango growers of the district which will be complied with.

Budding of bor, pruning of grapes, guavas, mosambi, etc., and dusting of mango plants with sulphur was done at several places in the district. Horticultural sub-overseer visited about 123 fruit gardens and gave necessary help on the spot for the better management of these gardens.

With a view to train farmers in the technique of fruit cultivation to cope up with the expansion of fruit farming in the district one week's classes were held during the months of October and November at Anand, Borsad and Uttarsanda. In all 200 persons took advantage of these classes.

65. *Trial of new crops.*—Wheat strains 808, 809, 224 and Pusa 4 were tested in the villages of Matar and Kapadvanj talukas. No. 224 and Pusa 4 seem promising.

Rice 184 was tested at Savali of the Kapadvanj taluka. Results seem promising.

Groundnut magadi was tested at Antroli in Kapadvanj taluka. Results seem promising.

66. *Village organisations.*—"Village Sanghs" were formed at Samarkha village of the Anand taluka and at Vasana village of the Borsad taluka for introducing agricultural improvements and social reforms through organised efforts.

Clubs of the past Bias class students who carry on farming were organised at Lambhwel of the Anand taluka and Uttarsanda of the Nadiad taluka with a view to keep them progressive and interested in farming and their progress will be watched.

67. *Plant-pullers.*—As a result of propaganda 160 plant pullers were introduced in 10 mal villages of Kapadvanj and Thasra talukas and about 600 bighas of cotton area was cleared up during the year.

Broach District.

68. *Trials in cultivators' fields.*—B. D. 8 cotton was tried with local for wilt resistance and outturn in the black cotton soil of the district. Out of 10 trials, 8 were successful till the end and their results show the following conclusions :—

(*a*) The increase was 23 per cent. yield in favour of B. D. 8.

(*b*) Minimum outturn of B. D. 8 was 257 and maximum 902 lbs. per acre ; while that of local was 213 and 670 lbs. respectively.

(*c*) Incidence of wilt in B. D. 8 was practically nil ; while it varied from 6 to 27 per cent. in case of local.

The cultivators were much impressed with the qualities of B. D. 8, viz. wilt resistance and higher yield. As there was good demand for seed, arrangements were made at 5 places for separate ginning of B. D. 8 kapas.

69. *Jowar strain No. 10* was tried in the Bara villages at several places but the results were not encouraging. The colour of grain and consistency and form of heads are not liked by the cultivators. Its only good point is quick growing and hence early ripening.

Jowar strain No. 8 was tried in the kanam tract. Its yield is on the whole superior to local. It is better than the local mixture but inferior to local mass selected seeds. Its fodder and grain were not found attractive to the cultivators.

70. *Wheat* 224.—The District Co-operative Bank has resolved to distribute 224 wheat seed to the extent of 24,000 lbs. Its reddish tinge is no disadvantage in this tract.

71. *Groundnut.*—Cotton after groundnut was found by the District Agricultural Overseer on an inquiry to yield 25 per cent. more.

72. *Demonstrations.*—Some 20 local demonstrations showing wilt resistance of B. D. 8 and its better stand against the local, ploughing in of sann green manure, sulphur dusting on mangoes against hoppers and working of Olpad wheat thresher were held and attended by about

500 cultivators. Party of local elite, was also taken on the farm to show them the farm work and district activities of the agricultural department.

73. *Manures.*—3,440 lbs. of sulphate of ammonia was distributed for manuring garden crops specially onion. 65,200 lbs. of sann seed for green manuring and 2,31,360 lbs. of castor-cake are supplied.

74. *Control of jowar smut.*—During the year only 1,500 sulphur packets were distributed. 500 were given to the Mamlatdar, Wagra, who alone took interest in this work.

75. *Cotton boll-worm clean-up scheme.*—The actual clean-up work was over by the end of May 1933 and the year under report was utilised to take observations (1) on the incidence of boll-worm pest with a view to find out how far clean-up measures have controlled the pest and (2) on the effect of the pest on the crop of cotton with a view to see how far the crop is protected from pest and what increase in yield is obtained thereby.

Observations show that the pest appeared a few weeks later in the central area of the clean-up zone as compared with non-clean up zone.

Besides a range of 15 miles along Derol, Argama, Wagra, Vahial and Pakhajan showed a much smaller boll-worm population as compared with most of the outside centres, during the important period of growth of cotton crop when boll-worm damage is highest. Import of bhindi pods for vegetable was noted to be responsible for spreading infection to some centres.

When we compare the boll-worm population records of last four years, it shows that the clean-up zone used to have much greater infestation of boll-worm in the past in the abovementioned period of plant growth. Night caging observations show that the difference between protected and unprotected plants were considerably minimised and both the sets of plants appeared similar as regards nature of growth and bearing of bolls. Cotton plants in the tract also appeared tall and had matured bolls even on the lowest fruiting branches as observed in night caged plants. Outturn of the crop was exceptionally good as compared with the crop in the previous season which was also a good season. Inquiries showed that the yield of crop in the clean-up zone was easily about 25 per cent. more than previous season whereas in the non-clean up zone the crop was not as good as that of last year.

76. *Cotton boll-worm control in Broach district north of the river Narbuda.*—The District Agricultural Overseer, Broach, was assisted by special staff of a graduate and 4 non-graduate assistants paid from the funds of the Indian Central Cotton Committee. The staff devoted a great deal of their attention to Jambusar, part of Amod and Broach that were not in the old clean-up scheme. The staff did intensive propaganda to educate the cultivators on the pest and use of plant puller to control it, with the help of magic lantern and field demonstrations. Help of local leaders were also taken to take up cotton pulling work and finish it before middle of May. The available plant pullers viz., 1,300 were sold through 20 Depôts and 2,200 plant pullers were sold by other

agencies. It was noticed that full demand of plant pullers was not met by the manufacturer and in some cases prices were also raised. Owing to depression farmers were not keen to pay more than Re. 1 for each. Besides Jambusar light soil tract demanded much stronger plant pullers for their vigorous cotton stalks. This also could not be met. However by 12th May 80 per cent. of cotton in Broach, 90 per cent. in Amod, 75 per cent. in Wagra and 40 per cent. in Jambusar were uprooted and what were left then were due to want of plant pullers and the want of early settlement of leases with the landlords and Court-of-wards in charge of "minors" estates and backwardness of some cultivators, except in Jambusar taluka where additional difficulty of stronger cotton was felt.

Surat District.

77. *Cotton seed multiplication and distribution.*—During the year after closely studying the reports of trials of 1027 A.L.F., I A.L.B., and the actual market position in India, the Indian Central Cotton Committee decided that their funds should be spent for the spread of seed of 1027 A.L.F., cotton and sanctioned a subsidy of Rs. 65,000 for a period of 5 years. The department accepted the policy and the seed of 1027 A.L.F., cotton was produced and distributed as under:—

The department controlled 13,928 acres under 4 groups. Out of this 1,095 acres were grown with Surat farm pedigree seed. The total quantity of kapas ginned at 4 centres was 4,146 bhars giving 1,591 candies of lint.

Seed production.—

Surat farm made available	.. 21,945 lbs.. of pedigree seed.
Four groups made available	.. 22,90,873 lbs.
Total seed made available	.. 23,12,818 lbs.

Experience of last three years seed distribution work showed that the demand of seed of 1027 A.L.F., was gradually falling and goghari seed was being spread by interested parties for adulterating it with 1027 A.L.F. cotton. However the press reports about the spread of goghari and the lower price paid for Navsari cotton awakened the gin owners and cultivators to the danger of further lowering the reputation of Surat cotton. The department of agriculture took advantage of the situation and very intensive propaganda was organised in Surat district with the help of the Collector of Surat and the gin-owners were invited to distribute 1027 A.L.F., cotton seed through their gins and as a result of the co-operation of the gin-owners, co-operative societies, cotton buyers and millowners' associations of Bombay and Ahmedabad, the department has been able to impress upon all concerned in cotton growing, and trade in Surat that first and foremost requirement of Surat tract is to have one type of cotton viz., 1027 A.L.F., grown and ginned and pressed pure.

As a result of this intensive propaganda the department of agriculture has distributed 23,12,818 lbs. of seed as under:—

15,06,305 lbs. of seed were supplied to Surat farmers through 28 Depôts.

4,28,684 lbs. of seed were supplied to Surat farmers through Hansot Society.

2,56,554 lbs. of seed were supplied to Chhota Udepur State.

1,21,275 lbs. of seed were supplied to Baroda State.

It may be mentioned that Rajpipla State did not take any seed from the department this year.

It is worth noting that in the history of seed distribution in Surat the department had never distributed more than about 8½ lacs of lbs. of seed a year in Surat district; but during the year the department has distributed more than 19 lacs of lbs. of seed which is a distinct improvement. It may as well be mentioned that the Surat district and Ankleshwar has about 2⅓ lacs of acres under cotton and even though the department is distributing for the last 10 years about 8 lacs of lbs., of seed a year, the department never claimed to have driven goghari out of Surat district. Even though the seed distribution of this year has come to 19 lacs of lbs. I cannot be bold enough to assert that I would be able to drive out goghari without village to village inspection to persuade every farmer to grow 1027 A.L.F. and without sincere co-operation of every gin-owner and cotton merchant by refusing to buy or gin any goghari. Our neighbour Baroda State has about 2 lacs of acres under cotton and it is worth noting that the State has agreed to co-operate by spreading 1027 A.L.F., all over their territory and driving out goghari. If we are to succeed in our work of having 1027 A.L.F., for the Surat and Navsari tract we need about 40 lacs of lbs. of seed a year for Surat and 40 lacs of lbs. of seed for Baroda territory and about 20 lacs of lbs. of seed for Rajpipla State. This would need a great and consistent effort on the part of Baroda and British Departments of Agriculture.

One relieving feature of the situation is that the long standing opposition of Sonsak Co-operative Cotton Sale Society to the use of 1027 A.L.F., seed has been won over and the Society has taken about 2 lacs of lbs. of seed of 1027 A.L.F., cotton as a policy and the Society has been accepted as a fifth seed group of the Department. Other co-operative Societies have also taken 1027 A.L.F., Seed.

78. *Jowar Budh-perio* 53.—18,000 lbs. of pure seed was distributed in Surat district.

79. *Rice-Kolamba* 184 *and* 401.—The trials were taken in comparison with kada. Both have yielded better like last year inspite of unfavourable season. No. 401 was later in flowering; but yielded the best and is also superior in quality.

80. *Wheat.*—Pusa 4 and Bansi 224 were tested among themselves. Pusa 4 was earlier by a fortnight than Bansi 224 and it has yielded lower than the latter like last year. Both these varieties are recommended in preference to local according to the requirements.

81. *Sugarcane Co.* 213.—The area under this type is now 109 acres. This year in Pardi taluka, it required only 6 waterings and is thus increasingly popular.

Two furnaces of Hadi's type were constructed to make sugar. This year in all three furnaces had worked. The average working capacity per hour was 600 lbs. of cane juice. 25,000 lbs. of sugar was prepared. Three demonstrations were held for preparing sugar and 400 cultivators attended these demonstrations.

82. *Distribution of manures.*—Five tons of bone-meal for mango trees and 52,560 lbs. of denatured salt for fruit trees were distributed. Besides this, 20 tons of artificials were used in the sugarcane tract, due to the sales by the Agent of the Imperial Chemical Industries of Bombay at five places.

83. *Distribution of seeds and implements.*—

Sugarcane Co. 213 ..	4,00,000	sets.	Surat District.
Sugarcane other types ..	4,100	,,	
Suran	19,240	lbs.	Supplied outside.
Ginger	1,110	,,	
Turmeric	100	,,	
Yams	1,480	,,	
Chikoo grafts ..	40	in Nos.	
Mango grafts ..	79	,, ,,	
Budded mosambi plants ..	150		For Surat District.
Budded naval orange ..	40		
Italian lemons ..	40		
Horizontal power crushers	2		
Sugar centrifugal machine	1		

84. *Sulphur dusting demonstrations.*—Eight demonstrations were held. In all 44 machines were working. 7,500 trees were treated, out of which 5,000 were done by the cultivators. In all 18 tons of sulphur dust were sold in the tract. The cost of Rs. 70 for the dust gun machine is prohibitive. Vigorous propaganda for the removal of a parasite loranthus on mango trees was carried out, 25,000 trees were cleared.

85. *Convex blades for groundnut harvester.*—75 blades for uprooting groundnut were used in Chorashi and Olpad talukas and are becoming popular.

86. *Boll-worm control scheme.*—A graduate and six non-graduate assistants were appointed from the funds of the Indian Central Cotton Committee. Intensive propaganda was organised along with the seed distribution propaganda and as a result of this about 49,000 acres of cotton was uprooted. The area hackled by *Kudali* is yet more than three times this and unless arrangements are made to distribute a large number of plant pullers at a reasonable cost of Re. 1 and more intensive campaign is undertaken, it is not possible to ensure the use of plant puller to uproot every cotton plant. Relieving feature is that most of the Surat people remove cotton stalks by middle of May.

V—Organisation.

86A. *Divisional Board.*—In all four meetings were held, one under the Chairmanship of the Assistant Registrar and the three under the Deputy Director of Agriculture, Gujarat. New members were nominated

on the Divisional Board from January 1934 for a period of two years and they are taking keen interest in the work. Cotton members on the Board attended all the meetings.

87. *Taluka Development Associations.*—There are in all six Taluka Development Associations of which five are doing good work and one viz. the South Daskroi Association has very small fund to do any substantial work. Other Associations also need more funds and it is suggested that they should reduce their subscriptions to induce large number of cultivators to come in.

Agricultural Associations.—The old Bulsar Association has been revived and has begun working from this season.

The Broach Agricultural Association has restricted its quarterly to the publication of reports of rural uplift work in Gujarat and has ceased to deal with Agricultural subjects as in the past.

88. *Agricultural Co-operation.*—The agricultural staff helped the co-operative societies whenever their help was required by the societies.

The Co-operative Institute, Surat, in co-operation with the Agricultural interest has started to publish a new Gujarati monthly called " Khedut, Kheti and Sahakar " and its development is being watched with interest.

89. The cotton policy in South Gujarat is once for all settled with the help of the Indian Central Cotton Committee by accepting the grant of Indian Central Cotton Committee for spreading the seed of 1027 A.L.F. alone in Surat tract.

VI—Agricultural Services.

90. *Supply of Premium Bulls in the Division.*—14 bulls were supplied as premium bulls in the non-breeding zone, 11 from Surat Dairy and three from Chharodi Northcote Cattle Farm.

91. *Pest control.*—Packets of arsenic and strychnine were supplied to cultivators for destruction of jackals and rats.

92. *Mechanical help.*—During the year the Mechanical Assistant received 43 applications from the cultivators as against 34 last year, 30 were from Surat District, seven from Broach District, one from Kaira, one from Panch Mahals and four from Thana District. Out of these he could attend to 38 applications. Besides he attended to the repairs to the Departmental machines at Surat farm and Khandesh.

Details of the work done by him are as under :—

(1)	Erection and re-erection	7
(2)	Site survey	11
(3)	Drawings or sketches and estimates ..	10
(4)	Advice in repairing the engines	7
(5)	Re-erection of pump	2
(6)	Advice in repairing the tractor	1
(7)	Attended the repairs to Departmental machines at Surat farm and Khandesh and other miscellaneous works.	

93. *Agricultural advice.*—The staff is occasionally approached by the farmers and the officers of the neighbouring States for help and advice regarding agricultural improvements and such requests are complied with.

VII—Educational Work.

94. The staff inspects and examines the Agricultural Bias Classes and conduct Vernacular Final Examination with Agricultural Bias.

VIII—Publicity.

95. Members of the staff contributed several articles to the Broach Agricultural and Industrial Quarterly and the new magazine called "Khedut, Kheti and Sahakar" published by a special committee organised for the purpose. Gujarati leaflets on Cotton Policy in South Gujarat were also published.

IX—Miscellaneous.

96. The staff on the whole worked well.

B. S. PATEL,

Deputy Director of Agriculture,
Gujarat, Surat.

Surat, the 7th August 1934.

Programme of Work to be done under the Deputy Director of Agriculture, Gujarat, Surat, for the year 1934-35.

I—Research.

Surat.

(*a*) COTTON.

1. Evolving a variety that will gin higher than 1027 A.L.F., and will spin the same by studying various crosses on hand, or selections from the local.

2. Attempting to improve spinning of 1027 A.L.F., by selection of crosses.

3. Comparative yield tests of some pure types and a promising culture from 1027 cross.

4. Production of selfed seed of cotton.

5. Trial of vernalized versus unvernalised seed of 1027 A.L.F.

(*b*) JOWAR.

1. Testing Bardoli jowar selection for yield.

2. Production of selfed seed of Budh perio 53.

Broach.

COTTON.

1. Study of crosses for combining wilt-resistance and superior fibre qualities of B. D. 8 with high ginning of other herbacium type.

2. Purification and testing of new promising selections Nos. 10, 12 and other selections from local.

3. Study of seasonal variations in wilt incidence.

4. Further testing of B. D. 8 and other pure strain plants that stood wilt in heavily inoculated pots under standard conditions, of disease development for getting a homozygous wilt-resistant race of cotton.

JOWAR AND WHEAT.

1. New selections will be studied for purity and economic characters.

2. Yield trial of Nos. 8, 222 and local.

3. Study of natural cross pollination in rabi jowars.

4. Manurial experiments :—(*a*) on cotton will be continued, (*b*) study of sann green manuring before the sowing of rabi jowar.

5. *Trial of new crops.*—Spanish peanut in cotton rotation under Broach conditions will be tried.

6. *Wheat.*—Selections made will be studied in details.

Tobacco Work at Nadiad.

1. Study of crosses for cigarette purposes.

2. Selection work in Keliu and Piliu.

3. Yield and quality tests of 10–3–1 and Harrison Special for cigarette purposes and quality test of N–1–5 and Gandiu 6 and Piliu 45 and Piliu 28 for local use.

4. Study of cost of cultivation and yield in different grades and money value of N–10–3 for cigarettes and Gandiu 6 for local use.

5. Studying the best method of growing tobacco seedlings.

6. Final comparison of flue curing versus rack curing in shade for cigarette tobacco.

Bajri.

1. Selection work to obtain a strain that will suit for grain as well as fodder will continue.

2. Replication trials for yield of the promising types with local.

Castor.

1. Maintenance and further purification of the types 5 and 20.

Viramgam.

1. Multiplication of seeds of wagad 8.

2. Evolving a type that will spin higher than wagad 8, combined with all the good characters of wagad 8.

3. Yield trials of 4 strains from the cross with wagad 8 and local.

Jowar.

1. Further selection in 4 cultures of 2 local jowars.

Surat Farm.

1. The seed multiplication work for cotton and jowar for Surat tract will continue.

2. The experiments on manures, ridge cultivation, spacing and dhaincha green manuring mentioned last year will continue. Also experiments on jowar thinning and late sowing of cotton and jowar after green manuring will be continued.

Surat Dairy.—Dairy herd of best Kankrej milch cows will be maintained and bulls will be given out as premium bulls as in the past.

Dohad Farm.

1. Production of pure seeds of spanish peanut, maize, Pusa 4, etc.

2. Holding drill and interculturing classes.

II—Propaganda.

Surat.

1. Control of seed multiplication of 1027 A.L.F. at five group centres and distribution of the resulting seed in the tract.

2. Checking the growing of goghari cottons in the bordering villages of Ankleshwar and in the south Surat tract.

3. Spread of Budh Perio 53. Sugarcane Co. 213.

4. Spread of clean-up measures for controlling cotton boll-worm.

5. In garden areas the propaganda for sulphur dusting of mango trees and cutting of the parasite loranthus will be followed very intensively.

6. Advocating proper manuring of fruit trees, rice and sugarcane.

7. Trial of new strains of rice suitable for the tract.

Broach.

1. Advocating sann green manuring in fallow lands.

2. Trial of small and magdi groundnuts in black and lighter soils respectively as a rotation crop to cotton.

3. Propaganda against jowar smut by distribution of sulphur packets.

4. Spread of clean-up measures particularly the use of plant-pullers.

5. Spread of improved seeds of B.D. 8 and wheat No. 224.

Kaira.

1. Seed distribution of Gandiu 6 and No. 28.

2. Trial of wider sowing of bajri, kodra and bavto.

3. Varietal trial of the following crops:—Piliu 45, groundnut spanish peanut and magdi, wheat 808, 224 and Pusa 4, rice K. 42 and K. 184.

4. Manurial trials of bajri, bavto and kodra.

5. Sulphur dusting on jiru against mildew.

6. Horticultural advice to cultivators regarding the improvement of the methods of growing fruit trees and introduction of new fruit plants.

Panch Mahals.

1. Spread of sugarcane Co. 213.

2. Introduction of cane crushers, better types of furnaces and gul pans.

3. Helping sugar-making by open pan system.

4. Advocating the use of sulphate of ammonia for the rice crop.

5. Introduction of magdi groundnut in suitable areas.

6. Spread of spanish peanut, Pusa 4, farm maize seed, etc.

7. Use of drill and wider sowing of maize and wheat.

8. Control of smut by distribution of sulphur packets.

Ahmedabad.

1. Trial of wagad 8 *versus* local cotton.
2. Trial of open boll types from wagad cross *versus* lalio cotton.
3. Multiplication of seed of wagad 8.
4. Trial of wider sowing of cotton and wheat.
5. Trial of improved wheat strains, viz. 224, 808 and 809 and of paddy K. 184.
6. Advocating the use of sulphate of ammonia to rice seedlings and to the field crop.
7. Introduction of basarai plantains, mango grafts, seedless guavas, chikoos, mosambi, budded lemon and bor budding.
8. Controlling smut in jowar by sulphur treatment.
9. Trial of threshers for economic wheat threshing.
10. Introduction of light ploughs for preliminary cultivation of paddy and the supply of spare parts.

B. S. PATEL,
Deputy Director of Agriculture,
Gujarat, Surat.

Surat, the 6th August 1934.

APPENDIX G.

Summary of Work done under the Professor of Agriculture, Poona, for the Year 1933-34.

Charge.—Mr. V. G. Gokhale continued to be in charge of the office of the Professor of Agriculture, throughout the year.

2. *Lines of work.*—These remained as before as indicated by the headings under which this summary is prepared.

3. *Staff.*—This remained as in 1932-33, viz., 8 assistants, two in the Provincial cadre and 6 in the upper subordinate cadre.

A—Teaching.

4. At the degree examination in the subject of Agriculture 95 as against 88·5 per cent. of last year, have passed. 13 students appeared for intensive study of crops—Sugarcane group—and the percentage of passes was 69 as against 78 of last year. Ten students appeared for Advanced Animal Husbandry and Dairying, the percentage of passing being 70 as against 86 of last year. In the Intermediate Agriculture 98 per cent. of the candidates have passed as against 95 of last year, in the subject of Agriculture.

The number of post-graduate students for M.Ag. work, was three. One of them Mr. P. M. Gaywala submitted his thesis during the year under report.

Five students took special Dairying courses during the year for periods varying from 1 to 3 months.

5. *The College farm.*—This farm is maintained mainly for the instruction in practical agriculture. It also affords facilities for research of the other sections of the College.

The total rainfall from 1st May 1933 to 30th April 1934 was 35·62 inches as against 29·86 inches of last year and an average of 27·56 inches. May recorded an anti-monsoon fall of 5·98 inches and this helped the land preparation very much. Regular monsoon commenced from the 21st of June thus enabling all kharif sowings to be finished earlier by about a fortnight than last year. Most crops germinated well but further growth of most of them was much handicapped, on account of a continued wet season in August and September recording over 15 inches of rain. The crops that suffered most were N. R. Cotton and *Gidgap jowar* for grain which had finally to be grubbed out. Cucurbits, betel-leaf, *bajri* and fodder *jowar* also suffered considerably but not as much as the former two. October registered a fall of 1·51 inches which helped a good stand of *rabi* crops. The rainfall in November of half an inch and even in December of one inch ensured a good harvest of rabi crops. Rust was noticed on Baxi wheat, but not on Pusa 4 wheat.

Low temperatures of 36° F. were reached three times, viz. 13th, 22nd and 31st January 1934. This caused about 10-15 per cent. damage to brinjals, sweet potato and *shalu jowar*.

The prominent crop pests and diseases were aphis on cabbage and rat-tail-radish, red beetels of cucumbers, mosaic on double beans, root rot on ginger. No suitable remedies have yet been known against these.

The effect of this year's season may be seen from the following table :—

Crop	1933-34	1932-33	Best yield in the history of the farm	
	Lbs.	Lbs.		
Bajri	502	1,000	1,764	1931-32
Cotton N. R.	failed ..	251	1,900	1919-20
Early groundnut	1,216	965	2,082	1912-13
Shalu jowar	1,896	2,132	2,578	1928-29

B—Research and Investigation.

6. *Position of nitrogenous fertilizers in Deccan crop-growing.*—This is the sixth and the last year of the investigation to test the value of 20 lbs. nitrogen in the case of *bajri*, and groundnut (early) crops and 20 and 40 of nitrogen in the case of the onion crop. The fertilisers tried were the same as in the last year. The results are as follows :—

With *bajri* 20 lbs. nitrogen in the form of nitrate of soda gave the highest increase of 58 per cent., which is statistically significant but not economically profitable, while the same quantity of nitrogen in the form of sulphate of ammonia gave a margin of profit even with less increase (37 per cent.). These results are on the same lines as last year and taking the last three years during which 20 lbs. nitrogen per acre was tried, Nitrate of soda has always given the highest and statistically significant increases. Sulphate of ammonia, however, showed economic and significant increases for 2 out of 3 years only.

With groundnuts, only nitrogen supplemented by potash and phosphoric acid gave significant increases more than *nitrogen alone* in any results (18 per cent.). This, however, is not economically profitable. Last year also, this treatment topped the results along with sulphate of ammonia and all other treatments were statistically significant. But only sulphate of ammonia was economically profitable. Taking the last three years, nitrogen supplemented by potash and phosphoric acid gave the highest significant but not economically profitable increases while only sulphate of ammonia showed significant increases in 2 out of 3 years and economical profit in one out of three years.

In the case of onions no treatment at the rate of 20 lbs. nitrogen showed any significant results while with 40 lbs. nitrogen all the treatments viz. sulphate of ammonia, nitrate of soda, calcium cyanamide, nicifos and complete fertiliser showed significant and economic increases over no fertiliser. During the past two years both 20 lbs. and 40 lbs. nitrogen had given significant and economic increases. Taking the first three years during which only 20 lbs. nitrogen was tried, the results on the whole were not consistently significant.

7. *Effect of different methods of applying sulphate of ammonia on shalu jowar.*—In this second year of trial broadcasting just before sowing, drilling a fortnight before sowing, drilling between the lines of seeds at sowing time, drilling the fertiliser by *Mogan* along with sowing, drilling it a fortnight after sowing were the different methods tried in comparison with no fertiliser. But no treatment showed any significant difference from the rest. The last year's results showed broadcasting just before sowing and drilling a fortnight before sowing, to give significant increases over the check.

8. *The position of organic matter in the application of artificial fertilisers.*—The results, in this fifth year of the investigation, show with Banilla Cotton that the combination of humus and sulphate of ammonia is not still in any way better than either of them tested singly in comparison with no manure.

9. *Vegetable work.*—Brinjal and sweet potatoes were taken this year for perfecting the technique of cultivation by manuring in the Deccan soils. The experiment consisted of testing potash, phosphoric acid and nitrogenous fertilisers supplying the elements in such quantities as are removed by an average crop in addition to 20 cart-loads of farm yard manure. The results with brinjals show that nitrogen alone rules the manuring, while in the case of sweet potatoes the supplementing with artificials showed no significant superiority over the farm yard manure alone.

The comparison of whole sets with cut sets of *Suran* for a period of three years showed significant advantage in favour of the former.

The business management of a garden holding (paragraph 10, page 153, of last year's report) of 8·5 acres was continued this year, 16 crops repeating the same as in the last year. The actual expenditure, including rent of land at Rs. 20 per acre and interest on capital at 6 per cent. came to Rs. 2,462–6–0 while the actual returns amounted to Rs. 2,948–8–0 which fell short of the estimates by Rs. 88–14–0 owing to drop in prices, as also very low yields of ginger owing to continued wet weather in the monsoon season.

10. *Economics of dry farming under conditions in Poona.*—This is the fifth year of the study. During the year the field work engaged 3 members of the family for 320 days at 8·45 hours per day in addition to 24 men, 206 women, 61 bullock units which had to be hired. The pair of bullocks had worked for 174 days in all. The family got a labour income of Rs. 417–3–0 for a holding of 35 acres as against Rs. 243–7–0 in the last year. The whole family expense was Rs. 330–4–0 for four members as against Rs. 542–7–0 of last year for five members.

During the period of all the five years the total family labour income was short of the total expenditure by Rs. 78–13–0.

11. *Position of leguminous crops in rotation with a cereal.*—The results of this year (the fourth in this study) do not show any significant difference in yield of *bajri* after *bajri* and *bajri* after *kulthi*, although the previous

two years showed that the latter gave higher yields by about 25 per cent. which though statistically significant was not economical.

12. *Effect of different kinds of preparatory tillage of dry crops in the Deccan.—Jowar* (for grain) and cotton were sown as per scheme. But both these crops had to be harrowed off owing to extremely poor growth due to continuous wet months of July and August. Wheat and linseed were grown in the rabi season. No differences could be marked out on the crops of *jowar* and cotton at the time of grubbing crop. The results with wheat did not show any significant difference between the yield of plots plowed 6 inches deep with a turnwrest plough and that of plots harrowed by the blade harrow either with or without farm yard manure. Linseed, however, showed significantly higher yields (14 per cent.) in the plowed plots as against the only harrowed plots. But the residue of 5 carts of farm yard manure in both the treatments showed no advantage at all.

13. *Trial of Akola No. 10 groundnuts.*—This strain of early groundnuts got from the C. P. was compared with Spanish peanut, on a ten *guntha* area. Akola 10 was later by a fortnight, the yield was about 15 per cent. less and had pods set deeper than Spanish peanut.

14. *Developing of higher milk yield in cows and buffaloes along with early maturity and regular calving.*—The programme as laid out in 1929 for further improvement of Sindhi cows and Surti buffaloes by inbreeding, line breeding and outcrossing was continued. The inbreeding of the King Arthur line of Sindhi cows has been found to lead to abortion or week progeny. The outcrossing of Sindhi cows with Tulip bull has not shown any conclusive advantage in the progeny that has so far come into performance.

Only one inbred heifer obtained by inbreeding Bhagi buffalo with her son Dairy butter calved during the year for the first time at an age 1¼ years earlier than her dam but her milk yield is less than the corresponding lactation of her dam.

None of the animals from other breeding policies followed has yet come into milk. But from general appearance the line bred progeny seems to have resemblance to the line in a majority of cases.

15. *Requirements of concentrates for Dairy animals under Deccan conditions.*—Safflower cake was once more compared with Groundnut cake quantity for quantity—as both were almost the same in protein contents—both on cows and buffaloes for milk production. The results have been vitiated due to the outbreak of foot and mouth disease.

16. *Regulation of bull services.*—This study taken up last year (para. 18, pp. 154) was continued with the same findings, viz. there is no certainty of the buffalo coming into subsequent heat at regular intervals if her first heat after calving is missed. Further cases are under trial.

Past 10 years records available are under examination and so far it has been seen that animals calving during July, August or September take 3 to 4 months for the following conception which enables them to

calve again during September to November respectively which corresponds to the period in which the greatest number of animals calve everywhere.

C.—Commercial Working of the College Dairy.

17. The year began with 229 animals and ended with 238. The animals continued to be in good health except for a mild run of "foot and mouth" in March.

18. The average yield of 3,729 lbs. per cow and that of 3,831·8 lbs. per buffalo per year shows an increase of 127 lbs. and 50·8 lbs. respectively which is due to normal fluctuations.

19. The cost of production of 100 lbs. of milk works out at Rs. 15·72 as against Rs. 16·61 of last year due mainly to reduction of Rs. 0·434 on maintenance of stock on account of cheaper rates of concentrates and Rs. 0·569 on management due to savings in the Manager's pay, against an increase of Rs. 0·578 due to more depreciation of buildings and dead-stock. The realization of Rs. 14·893 per 100 lbs. of milk disposed of is less than that of the last year by Rs. 0·676 due to general cheapening of milk rates in Poona, and a larger balance of unsold milk which had to be separated on account of some customers having left Poona during the plague epidemic.

20. The total area under fodder crops was 183·35 acres of which 147 acres were cropped once and the balance was made by cropping twice. The total green fodder produced was 18,578 lbs. as against 18,000 lbs. of last year. The cost of producing 100 lbs. of green fodder worked out at annas 7·55 as against 7·24 annas last year due to more manuring and more irrigation charges during large breaks of rains.

21. The grazing area of 38 acres furnished forage equivalent to the full requirements of roughage for 23 adult animals for 120 days as against the same period last year for 25 animals. The compartmental grazing on 12 acres in four blocks was continued and this carried 8 adult animals for 73 days as against 8 for 99 days of last year due to an unascertainable poorer stand of grass this year in spite of more rains.

D.—Aid and Assistance to the Public.

22. *Help to other sections of the College and other institutions.*—Help in the form of implements, labour, seeds, land and advice on agricultural matters was rendered to the various sections at the College, the Agricultural Engineer to Government and the Central Poultry Breeding Farm to the extent possible whenever asked for.

23. Students from several educational institutions in Poona as also the Vernacular Agricultural school of Dhulia and Kolhapur were shown round the College Farm and the College Dairy. Over 200 visitors from different parts of the Presidency were shown round the farm and the Dairy.

Visitors.—During the year under report His Excellency Sir Frederic Sykes, the then Governor of Bombay and Colonel Olver, Animal

Husbandry Expert to the Imperial Council of Agricultural Research, visited the Dairy.

24. In all over 750 enquiries regarding special agricultural and Dairy courses, implements, seeds, manures, crop growing etc. were replied.

25. *Bull services.*—The Agricultural College Dairy afforded bull services to 15 cows and 10 buffaloes of the public. Nine pedigree Surti Buffalo Bull-calves were given to the Live-stock Expert and 6 to the Deputy Director of Agriculture, S. D., Dharwar, for distribution as premium bulls to the public.

26. *Demonstrations and Shows.*—The Agricultural College Dairy put up 4 Dairy demonstrations at Ahmednagar (Patil's Darbar, November 1933), Nasik (December 1933), Borivli (February 1934), and at Mulegaon (Sholapur, February 1934).

27. *Publications.*—Mr. C. N. Dave published an article on the "Comparison of economics of disposal of milk and its products in the Poona Agricultural College Magazine, Vol. XXV, September 1933.

Mr. K. S. Kulkarny, Assistant Professor of Agriculture, published the second and revised edition of his Marathi book "Amchi Sheti" which has been highly received by prominent Marathi journals.

28. *Summary of article published by Mr. C. N. Dave—*

Dave, C. N. :

"*The Comparison of economics of disposal of milk and its products*", *Poona Agricultural College Magazine, Vol. XXV, September* 1933.

(*i*) It is more economical to sell whole milk as such even at 8 lbs. per rupee than converting it into butter or *ghee* at rates obtaining around Poona city.

(*ii*) About 0·9 lbs. of butter fat is lost in converting 7·41 lbs. of butter into ghee.

(*iii*) About 0·75 lbs. of dry *babool* (Acacia arabica) fuel is required to prepare one pound of ghee or about 0·5 lbs. of fuel to clarify one pound of butter into ghee.

V. G. GOKHALE,
Professor of Agriculture.

Programme of Work under the Professor of Agriculture, Agricultural College, Poona, for the year 1934-35.

I. Teaching.

Teaching is the primary function of the staff of the Professsor of Agriculture's section and this work will continue as in the last year. This will occupy about 65 per cent. of the time of the staff.

II. Administration.

In connection with the teaching, two large institutions, viz. the College farm and the College Dairy, have to be run. The work under this section has increased steadily owing to greater and greater details in account and audit matters.

The heavy retrenchment of three graduate assistants and three non-graduate assistants from 1st March 1932, has increased the burden on the remaining staff.

III. Investigations and Research.

Only about 10 per cent. of the time of the staff is thus available for this work. Therefore only such pieces of investigation and research can be tackled as would be possible in such a broken up time. Subject to this limitation the following shows the programme under this head : —

A.—Omissions from the Programme for 1933–34.

Subject.	Investigator Professor of Agriculture in collaboration with	Reasons.
1. Accurate preliminary testing of artificial fertilisers.	Mr. P. M. Gaywala ..	Concluded.
2. Cut *vs.* whole sets of Suran ..	Mr. A. R. Neginhal, Lecturer in Agriculture.	Concluded.

B.—Continuation from the Programme of 1933–34.

Subject.	Investigator Professor of Agriculture in collaboration with	Reasons.
1. The influence of different kinds of preparatory tillage on cotton and jowar.	Mr. K. S. Kulkarny, Assistant Professor of Agriculture.	To collect data over a sufficiently long period.
2. The most profitable scheme for vegetable growing.	Mr. A. R. Neginhal, Lecturer in Agriculture.	For accumulated study.
3. Manurial requirements of Brinjals and sweet potatoes.	Do. do. ..	To get conclusive result.

Subject.	Investigator Professor of Agriculture in collaboration with	Reasons.
4. Study of a dry farming unit under Poona conditions.	Mr. R. M. Chaudhari, II Lecturer in Agriculture.	To collect data over a long period.
5. Position of Leguminous crops in rotation with a cereal.	Mr. R. S. Kittur, Demonstrator in Agriculture.	Do. do.
6. Development of higher milk yield in cows and buffaloes along with early maturity and regular calving.	Assistant Professor of Dairying and Animal husbandry.	Further development.
7. Requirement of concentrated foods for Dairy cattle in the Deccan.	Mr. G. V. Hardikar, Lecturer in Dairying and Mr. C. N. Dave, Demonstrator in Dairying.	Other concentrates to be tried.

V. G. GOKHALE,

Professor of Agriculture.

APPENDIX H.

Summary of Work done under the Agricultural Chemist to Government, Bombay, Poona, for the Year 1933-34.

During the year under report I was in charge of the office and the Laboratory of the Agricultural Chemist to Government, Bombay Presidency; throughout the year.

It is usual to divide the work under the Agricultural Chemist into the following categories: —

1. Analytical work (*a*) for the public; (*b*) for the Agricultural and other Government Departments or Institutions.
2. Research work and publications.
3. Teaching.
4. Water finding.
5. General—shows and demonstrations staff, etc.

1. *Analytical Work.*

The analytical work includes analysis of samples and advice based on the results of analysis during the year under report. The number of samples received for analysis was 603. Out of these 547 were from the Agricultural and other Government Departments while 56 were received from the private bodies and persons.

The types of samples analysed received from Government Officers are indicated by the following:—

Soils for effects of Liming came from the Livestock Expert. Manured soils and crops grown on them were analysed for the Professor of Agriculture for his manurial experiments. Cattle feeds were analysed in connection with feeding experiments of the Professor of Agriculture and also of the Livestock Expert. Tobacco samples from the Tobacco Breeder, Linseed varieties from the Economic Botanist, jowar fodders from Viramgam and groundnut varieties from the Dharwar Farm, were done in connection with the investigation work carried on by the Officers of the Agricultural Department.

Private samples included waters for irrigation, sugar samples from Sugar Works, new varieties of sugar-canes, soils and manures, etc.

The number of samples received from private concerns or persons, is, for two years past, small on account of the introduction of fees for private samples. In the year 1932-33 the number was 44 while in the year under report it is 56.

2. *Research Work and Publications.*

Investigations of small problems referred to the Agricultural Chemist are included under analytical work and it is only the larger and definite problems that are included under research—

1. The study of the manurial constituents assimilated by crops was completed and has been published along with manures in the form of a Departmental Bulletin.

2. The study of the chemical changes during the formation and germination of rice grain was completed. The results have been sent for publication.

3. The results of the study of digestibility of rice will soon be sent for publication.

4. Compost making from farm residues was completed last year. It is now contemplated to publish the work as a Departmental Bulletin.

5. A preliminary study of the effects of sodium nitrate on the earthworms in soils was completed and will be published as a small paper.

6. Investigation of the recuperation of nitrogen by soils under irrigation conditions was started in the year under report and it will be completed next year.

7. The study of the presence of copper in cattle feeds was taken up but could not be continued for want of time and on account of transfers of experienced men to other research schemes.

Much of the Research work had to be cut down on account of the retrenchment of the staff.

Publications.

The following papers on important research works were published during 1933–34 :—

1. Nitrification of oil cakes in the Typical soils of the Bombay Presidency—University Journal, September 1933.
2. Composition of Important Manures and Manurial Constituents of Important Crops in Western India—Bombay Agricultural Department, Bulletin No. 174 of 1933.
3. Movement of Sulphate of Ammonia when added as Fertiliser to Soils—Indian Journal of Agricultural Science, February 1934.
4. "Experiments in Manuring Crops in the Bombay Presidency, 1896–1931." Bombay Agricultural Department publication.
5. "Effects of Oil-cakes on some Physical Properties of Soil"—Agricultural College Magazine, Volume XXV, No. 1, July 1933.

3. *Teaching*

I am in charge of the teaching of Chemistry and Geology to all the classes of the Poona Agricultural College. As indicated before, the retrenchment in the staff has affected the Chemistry Section very severely. The teaching per head of the staff is perhaps more in Chemistry than in any other section at the College. As soon as the economic stress improves a little bit, it is necessary to restore the retrenched staff from the Chemistry Section. During the year under report one Post-graduate student got the M.Ag. degree of the Bombay University by thesis. At present there is one student studying for the M.Sc. and another is taking a special course in distillation of essential oils.

4. *Water-finder Work.*

The water-finder section under me was completely retrenched in the year 1932–33 but for Departmental purposes I still test sites for underground water. During the year under report sites were tested for water for the Dry Farming Scheme at Sholapur and Bijapur. The sites have yielded water as indicated by me.

5. *General.*

During the year under report I sent my assistants to arrange exhibits of the Chemistry Section at the shows held at Ahmednagar and Chikodi.

Staff.—Mr. V. N. Gokhale went to England and is still studying in the London University. Dr. J. A. Daji has been transferred to the Dry Farming Research Scheme and Mr. B. M. Joshi to the Cold Storage Scheme. Mr. N. R. Gurjar who was transferred to North Central Division came back in place of Dr. Daji and Mr. N. R. Bhat was taken in place of Mr. B. M. Joshi. Mr. V. S. Abhyankar is transferred from the Southern Division to work in the Nitrogen Recuperation Scheme financed by the Sir Sassoon David Trust Fund. My clerk Mr. S. V. Datar has been transferred to Bankapur.

I am glad to note that every one of my staff rendered loyal co-operation in carrying out the work of my section.

D. L. SAHASRABUDDHE,
Agricultural Chemist to Government,
Bombay, Poona.

Poona, 2nd July 1934.

ABSTRACT OF PAPER.

Nitrification of Oil-Cakes in the Typical Soils of the Bombay Presidency.

(The Journal of the University of Bombay, Volume II, Part II, September 1933.)

Nitrogenous manures are important and their value is usually judged by the percentage of nitrogen they contain. It should also depend on the rate of nitrification. The latter may vary according to the nature of the soil. For this study the oil-cakes selected were (1) groundnut, (2) castor cake and (3) safflower cake and the soils used were (1) the medium black soil derived from trap, (2) laterite soil from Belgaum and (3) *goradu* soil from Nadiad.

The uniformly ground samples of oil-cakes were sterilised at 120° C. for an hour and mixed evenly with different soils and the water contents were made up to 50 per cent. of the water holding capacity. The samples were analysed every fortnight for 100 days for ammoniacal and nitric nitrogen. It was shown that groundnut cake was the most easily nitrifiable and safflower the slowest of the three. Of the soils examined

medium black soil was the most active and laterite the least of the three. It was found that there was loss of nitrogen. Groundnut cake lost the most. Out of the soils *goradu* lost most easily. The loss was found to start with accumulation of nitric nitrogen.

ABSTRACT OF PAPER.

Composition of important Manures and Manurial Constituents of important Crops in Western India.

(Agricultural Department Bulletin No. 174 of 1933.)

A very large number of manures of all types have been analysed in the laboratory of the Agricultural Chemist. These have been classified and systematically arranged and published in this bulletin. It is important to know what amount of different plant-foods are removed by the various crops. All the important crops were specially analysed and from the outturns of the crops the total quantities of nitrogen, potash, phosphoric acid and lime removed by each crop per acre annually are calculated and are given in this bulletin for the use of the public.

ABSTRACT OF PAPER.

Movement of Sulphate of Ammonia when added as a Fertilizer to soils.

(Indian Journal of Agricultural Science, Volume IV, Part I, February 1934.)

During the experiments in manuring *rabi* crops at the Poona Agricultural College Farm it was observed that the Sulphate of Ammonia sown between two rows of *rabi jowar*, 18 inches apart, it did not show any effect on the crop. This led to the suspicion that perhaps the fertilizer did not move enough to be within the feeding zone of the roots of the crop. Experiments were, therefore, tried to study the movements of sulphate of ammonia on different soils with varying conditions of water. Both horizontal and vertical movements were studied. It was found that, whatever the proportion of water the fertilizer did not move beyond three inches in any direction. Field experiments clearly showed that a *rabi* crop of *jowar* can use sulphate of ammonia if it is put within three inches from the plants. If it is beyond three inches and within six inches it may be used only to a very slight extent but if beyond six inches it cannot be used at all. The study of the root system of *jowar* showed that a very large proportion of the roots feed within three inches from the plant and any fertilizer to be useful must come within this range.

ABSTRACT OF PAPER.

Experiments in manuring Crops in the Bombay Presidency, 1896-1931.

(Agricultural Department Publication, 1934.)

It is a collation of all the manurial experiments done on the various farms of the Bombay Presidency from 1896–1931. All the results have

been calculated with net profits and statistically interpreted. The experiments are classified by manures, by crops and by farms and a detailed summary of the experiments has been given. The publication contains three important maps (1) soil map, (2) rainfall map and (3) geological map.

The statistical methods used are given in the appendix.

ABSTRACT OF PAPER.

Effects of Oil-cakes on some Physical Properties of Soils.

(Agricultural College Magazine, Volume XXV, No. 1, July 1933.)

A study was undertaken to see if any of the important physical properties of the soils were affected when oil-cakes were given as manure. The soils selected were (1) medium black soil from trap, (2) laterite soil and (3) goradu soil. The oil-cakes used were (1) groundnut-cake, (2) castor-cake and (3) safflower-cake and the physical properties studied were (1) maximum water holding capacity, (2) capillarity, (3) sticky point and (4) settling capacity. Finely ground oil-cakes were sterilised and well mixed with the soils. The water contents were made up to 50 per cent. of maximum water holding capacity. Tests were made every fortnight for 100 days.

The experiments show that there is no change in the water holding capacity of the soil. The capillarity is affected a good deal. A rise in the "sticky point" and delay in settling takes place in the medium black soil but not in other soils.

Programme of Work under the Agricultural Chemist to Government for 1934-35.

Due to retrenchment of staff very little Research work can be taken. In addition to the analytical work, investigation will be carried on in connection with the following problems :—

1. Recuperation of nitrogen by soils under conditions of irrigation.
2. Ash constituents of cattle feeds and vegetables.
3. Preventing rancidity of groundnut oil-cake.
4. Proteids of the groundnut cake.

D. L. SAHASRABUDDHE,
Agricultural Chemist to Government,
Bombay, Poona.

Poona, 2nd July 1934.

APPENDIX I.

Summary of Work done under the Economic Botanist to Government of Bombay, Poona, for the Year 1933–34.

During the year under report Professor L. S. S. Kumar and Mr. V. M. Chavan continued to officiate as Economic Botanist to Government of Bombay, Poona, and Assistant Professor of Botany respectively, while Mr. S. R. Godbole as Assistant Economic Botanist and Mr. W. V. Joshi as Demonstrator in Botany carried out their respective work.

Bajri Research.

The replication test on mixture *versus* individual strains of *bajri* according to Latin Square method was repeated for the second year. The types included in the replication were the Poona selections 54, 37, 59, mixture of the three Poona selections in equal proportion, F_1 of the mixture, hybrid 54 × 59, fresh Akola and Poona local.

The result of the Latin Square experiment with the above eight types gave significant varietal differences. The hybrid 54 × 59 was significantly superior to all other types giving 1,077 lbs. of grain and 1,750 lbs. of fodder per acre. Local proved inferior to all other types and significantly inferior to 59 and F_1 of the mixture. 59 was superior to 54 while F_1 of the mixture was superior to Akola and the mixture.

It has been decided to continue the replicated test for another year.

Grass Research.

Experiment on Rotational Grazing at Mangdara Kuran near Diva Ghat, Poona, was continued with the addition of land development work and the study of invasion of Spear Grass (*Andropogon contortus*).

1. *Rotational grazing.*—The number of animals put to grazing during the year under report were 250 as against 200 of last year. The grazing commenced on the 14th August 1933, and lasted till the end of February 1934. The period of grazing in each block depended on the condition and stand of the vegetation. For the first few months owing to plenty of feed being available the interval between two shifts was from 15 to 20 days which gradually fell to 5 days as the season advanced and the vegetation showed signs of drying up.

2. *Effect of grazing alone on live weight of animals.*—In addition to determining the increase in the total units grazed from year to year, this year an experiment to find out the effect of grazing alone on the live weight of animals was taken up. A herd of 24 young animals was selected and weighed three times during the grazing season. The weights were taken at the commencement, middle and end of the experiment. The result shows that there was an average increase in live weight of 31·8 lbs. or 8·9 per cent. by the end of December 1933 and a loss of 20·5 lbs. or 6·3 per cent. by the end of February 1934. The net gain in weight was only 11·3 lbs. or 2·6 per cent. Allowing for the

increase in weight due to growth in the young animals, maintaining them purely on grazing without their being supplemented by stall feeding has not affected them adversely. This suggests that young animals could be kept on grass in areas where it is plenty without having recourse to stall feeding.

3. *Grass yield by quadrat method.*—Another experiment to determine the change in the yield of grasses has been taken up this year. The grasses from 20 sample random quadrats 10′ × 10′ each were cut from a block every time before it was opened for grazing. The records of the yield of this year will be compared with those of the next two years.

4. *Study of Andropogon contortus.*—Areas of pure stand of *Andropogon contortus* (spear grass) have been mapped from each of the four blocks to study the effect of grazing on that grass.

5. *Land development.*—Bunds have been erected in blocks 3 and 4 thus increasing the area under bunds. The bunds constructed in the previous year in addition to accumulating silt washed down by last year's rains, have given a start to new vegetation which, it is hoped, will get a good hold in near future.

6. *Irrigated grass experiment.*—As an outcome of discussion at the Cresco meeting of 1933, an experiment on irrigated grasses has been planned in co-operation with the Live Stock Expert to Government, Bombay Presidency, Poona. The experiment is laid out at the Cattle Breeding Farm, Betegaon. It is proposed to determine the most suitable (*a*) the interval between waterings and (*b*) interval between two cuttings in order to obtain the maximum yield of green fodder. The following four types of grasses have been taken up for trial :—

(1) Elephant grass .. (*Pennisetum purpurem.*)
(2) Guinea ,, .. (*Panicum maximum.*)
(3) Sudan ,, .. (*Andropogon halepensis* ?)
(4) Rhodes ,, .. (*Chloris gayana.*)

7. *Acclimatisation of Australian grasses.*—15 different grasses obtained from Australia, in exchange for those supplied by us, have been grown and seeds collected. These will be grown on a larger scale and when acclimatised will be distributed to the different farms in the Presidency.

8. *Weed killing experiment.*—Weed infested *hariali* plots were treated with Calcined iron sulphate (one of the proprietary compounds manufactured by the Imperial Chemical Industries, Ltd.). The weeds were killed by this compound but it has been found that the cost is so prohibitive that it cannot be generally recommended for use on a large scale.

Striga Research.

The experiment on conditions that determine the germination of *striga* seeds were continued on the same lines as last year and in addition several new experiments were also taken up.

Failure of germination of seeds of *striga lutea* and *striga densiflora* in the absence of contact with host (*jowar*) roots has again been confirmed. In a trial *striga* seeds germinated on artificial agar media containing the juice of *jowar* plant. Six months' continuous soaking in water had in no way impaired the power of germination of *striga* seeds while those of *jowar* had lost their vitality totally after 19 days. This suggests that the viability of the seeds of the parasite is not affected by prolonged water logged condition. *Striga* seeds germinate readily at depths of 1, 2 and 3 inches while at 4 inch depth it becomes difficult. The distance at which *striga* seeds germinated away from host root was on an average 2 m.m.; while the maximum distance was as much as 50 m.m. The thermal depth points of *jowar* and *striga* seeds respectively were 77°—78° C and 68°—69° C. The percentage of germination of the parasite seeds in contact with different varieties of *jowars* varied from 0·6-46 per cent. in all the varieties. Two plants which promise to be resistant to *striga* attack have been selected. A list of grass and non-grass hosts of *striga* is being prepared.

Orobanche Research.

The experiments on *Orobanche* are run on parallel lines to those on *striga*, since both are phanerogamic root parasites.

The seeds of *Orobanche* have been found to germinate some times in the absence of contact with host (Tobacco) roots. But germination under such conditions is very poor. Seeds of this parasite germinate easily in soil up to a depth of 4 inches. The thermal death points of host and parasite are 69°—70° C and 70°—72° C, the range being extremely narrow. The percentage of germination of *Orobanche* seeds in contact with eleven different varieties of tobacco varied from a minimum of 0·5 per cent. and a maximum of 26 to 73 per cent. according to the variety. A single resistant plant has been selected for further trials.

Linseed Breeding.

The tariff preference shown to Indian linseed as a result of the Ottawa Conference has resulted in the taking up of breeding work in this crop with a view to improve the types grown in this Presidency. Up to now no work on breeding superior varieties of linseed suitable for export had been attempted in this Presidency and consequently this work has been launched. During the year under report the work has been carried out from the grants of the Agricultural Department. A four year scheme for linseed breeding was prepared and submitted to the Sir Sassoon David Trust for sanctioning the grant. The scheme has been accepted and the money for the first year has been provided.

The material which formed a basis for selection consisted of 31 district samples and 16 pure types being selections from other Presidencies.

A varietal trial was made between the non-presidency and important local types with respect to yield. From each district samples 15 to 25 individual selections have been made on the basis of characters which go

to produce higher yield and from lines which have higher oil content. All the district samples were sent to the Agricultural Chemist to Government of Bombay, Poona, for ascertaining their oil percentages.

The results of the first year's trials roughly indicate that the local varieties are better yielders than any of the types from other provinces. The non-presidency types will be utilised for introducing the light colour of the seed into the Presidency types by hybridization.

Cytology.

The work on the Cytology of Sterility in 1027 A.L.F. cotton has been completed and it only requires now to confirm the results with an examination of the somatic tissue. The incidence of sterility in hybrids between American and Asiatic cotton is being examined cytologically. The work is partly completed. Material for cytological examination of several other plants have been fixed and embedded in paraffin but for want of time and staff these have had to be set aside.

Vernalization.

The work of Lyssenko and others in Russia on "Iarovization" or the hastening of the reproductive phase of the life period of plants by subjecting them to certain periods of darkness or light under certain specific conditions of moisture and temperature, has been adopted with certain modifications for trial on long seasoned crops of this Presidency. The trials are still in their preliminary stages and the right temperature, moisture along with the right period of exposure to darkness are all being determined. The trials are being made with both *kharif* and *rabi* crops with a view to minimise their vegetative period and hasten the onset of reproductive phase.

X-ray on Bajri.

The experiment consisted in the exposure of *Bajri* inflorescence and germinated seeds of different stages of development to X-ray for induc[illegible] mutation. This experiment was repeated for two successive years [illegible] although the exposure given was prolonged and exceeding that which is normally given to other plants, yet owing to the weak dose given produced no abnormality of any sort. F_2 progenies from the rayed plants have shown no abnormality.

Teaching.

The Economic Botanist to Government of Bombay, Poona, was assisted by the Assistant Professor of Botany and Demonstrator in Botany in teaching Botany and Advanced Plant Breeding, to the students of I.Ag., Jr. B.Ag., and Sr. B.Ag. classes. During the year two students had chosen Advanced Plant Breeding for their Optional subject and both of them passed at the University examination for the degree of B.Ag.

Seed Testing.

Total number of samples tested during the year was 345 and these consisted of 108 samples received from out-stations and 237 from the experiment on longevity of crops seeds, grass seeds and weeds. The result of 12 years of work on longevity of certain crop seeds appeared as a paper, an abstract of which appears elsewhere in this report.

Miscellaneous.

Replying to enquiries of economic importance, identification of plant specimens, supply of seed of economic crops to places in and out of India, forms part of the Ecomomic Botanist's work. During the year 213 samples were identified, 46 enquiries were dealt with and seeds and plants were supplied to enquirers in Russia, Egypt, West Africa, and Scotland besides those in India.

Publications.

(1) Kumar, L. S. S., and Godbole, S. R. :

"*Grassland Investigation in Western India.*" Imperial Bureau of Plant Genetics, Aberystwyth, Wales. Herbage Reviews. Vol. I, No. 4, December 1933.

The paper deals with the methods adopted in the experiments on the study of grasslands of the Bombay Presidency and their improvement. The methods followed are (1) General survey of various grasslands recording their botanical composition and the succession of vegetation, (2) Study of the effects of fencing, cutting, burning and land development on the vegetation, (3) Study of the effects of the rotational system of grazing on the vegetation as well as the animals.

Emphasis has been laid on the advantages of adopting the methods of controlled grazing especially in areas of deficient rainfall where the problem of grazing is very acute.

(2) Patwardhan, G. B., and Kumar, L. S. S. :

"*Summaries of the Annual Reports of the Experimental work done under the Economic Botanist to Government of Bombay, Poona, from* 1893 *to* 1916." Department of Agriculture, Bombay, Bulletin No. 172 of 1933.

The results of experiments carried out during last 23 years are given in a condensed form along with the date, the experimental farms on which they were carried and the names of the plants. Experiments include effect of grafting, root pruning, manurial trials, introduction and acclimatization of plants, improvement and selection of fruit trees and crop plants.

(3) Sonavne, K. M. :

"*Longevity of Crops seeds, Part II.*" Agriculture and Live Stock in India, Vol. IV, Part III, May 1934.

The result of testing continuously several crop seeds of economic importance for twelve years for their viability shows that of all the commonly grown crops pulse seeds retain their power of germination and viability the longest. Seeds of different varieties belonging to a species do not necessarily possess the same viability. A comparison between *deshi* and *Kabuli* variety of *Cicer arietinum* shows that the former retains its viability much longer and has not lost its power of germination at the end of twelve years while the latter has lost all vitality in nine years.

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Programme of Work under the Economic Botanist to Government of Bombay, Poona, for the Year 1934-35.

(1) *Bajri.*—A replicated test of mixture *versus* individual strains of Poona selections along with local and a few other varieties will be carried out according to Latin Square method.

(2) *Grass.*—Experiments on (*a*) Rotational grazing, (*b*) land development on a small scale at Mandara Kuran, (*c*) Weed killing and (*d*) Acclamatisation of exotic grasses will be continued.

(3) *Striga on Jowar.*—Further study on factors influencing the germination of the seed and the behaviour of the parasite will be taken up. Selection of *striga* resistant varieties of jowar for all the divisions in this Presidency will be continued.

(4) *Orobanche in tobacco.*—Experiment on conditions determining the germination of the parasite's seeds along with selection of a resistant line of tobacco will be made.

(5) *Linseed breeding.*—From the selected material of the 1933 season further selections for high yield and high oil content will be made at Poona and Bijapur.

(6) *Cytology.*—The Cytology of *Cephalandra indica* and varieties of cultivated and wild *bhendi* will be added to the work already on hand.

(7) *Seed testing.*—Work on longevity, dormancy period and percentage germination of some of the important grasses of Bombay Presidency will be carried further. The same experiment will be taken up in connection with some of the hemi-parasitic plants affecting crops and fruit trees.

(8) *Vernalization.*—Seeds of late maturing *Kharif* and *Rabi* crops will be vernalized to find out the effect of this treatment on their life period, particularly the reproductive phase.

(9) *Exotic Jowars.*—Acclamatisation trials of 107 varieties of West African Jowars received from the Director, Royal Botanic Gardens, Kew, Surrey, England, will be tried.

(10) *Tur and Groundnut.*—Study and classification of all the local types of *tur* (*Cajanus indicus*) and groundnut of the Bombay Presidency will be taken up.

(11) *Chavali* (*Vigna catajang*).—Collection of all the Presidency types of *Chavali* for studying and classification with a view to supply the information called for by the Director, Royal Botanic Gardens, Kew, Surrey, England, is being undertaken.

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APPENDIX J.

Summary of Work done under the Crop Botanist to Government of Bombay, Karjat (Kolaba), for the Year 1933-34.

Administration.

During the year under report Mr. B. S. Kadam held the charge of the post of the Crop Botanist.

Mr. V. K. Patankar continued as the graduate assistant in rice breeding at the Rice Breeding Station, Karjat.

During the year under report the graduate and the non-graduate staff and their families suffered very badly from malaria. Consequently Mr. Patankar went on leave from 17th November to 23rd December 1933; likewise the two non-graduate assistants, Messrs. G. G. Patil and Y. B. Shitole, were on leave for two and half and three months respectively. Continuous absence of one of the staff members hampered the progress of the work.

Messrs. R. K. Kulkarni and S. M. Patel were transferred to this section and throughout the year held the charge, respectively, of the Superintendent and Bajari Breeder at the Cereal Breeding Station, Kundewadi, Niphad.

The work at the Cereal Breeding Station has now been reorganised on scientific basis. It is fast increasing and much difficulty is experienced by the Superintendent as the station is not yet fully equipped. The station requires a clerk to cope with the increased clerical work.

The graduate staff at Kundewadi suffers badly for want of adequate housing facilities, and it is hoped that the staff will be provided with quarters in near future.

Rice Breeding.

Season.

1. The monsoon was unusually early this year, having commenced in the middle of May. There was a break and a restart from 28th May onwards. Sowing was done on the 2nd and 3rd of June. Unfortunately a long break, from 4th to 19th June, again supervened necessitating hand watering of the seedlings. At the transplanting time rains were insufficient, but later the monsoon settled down and its progress was normal. The total precipation including the month of May was 152·37.

Season Plot of K 42.

2. The yield of the season plot was 2,760 lbs. of grain and 2,840 lbs. of straw; the ratio being 1 : 1·03.

Replications of Improved Strains.

3. (*i*) *Early Kolamba strains.*—The replication consisted of four new strains derived from "K 401", K184 and local Ghosali. The experiment did not show any significant difference. The strain K184, however, was the poorest yielder. The experiment will be discontinued.

(*ii*) *Midlate Kolamba strains.*—The new strains K540 and K550 were compared with K153 and local Halwar. There was no significant difference. The strain K550 is definitely inferior. The other strain K540, however, is very promising being equally good yielding as K153 with the added advantage of being much finer. It has 77 grains per gram as against only 67 of K153; and this fact will make it more appreciable in the Thana district. The trial will be continued.

(*iii*) *Comparison of K42 and K226 with local.*—The two improved strains were replicated eight times with Kolamba and Zinya locals. The "Local" was made up by mechanical mixing of a number of samples. This was done as per decision of the Crop Research Committee held in 1933. Both the strains show superior yields over the respective locals, although none of them exceeds the general mean.

The comparison of K42 and K226 with locals will be discontinued as the strains are maintaining their superiority in the districts.

Study of "Gulsund".

4. The last year's Kolamba sample from Gulsund village in Panwel taluka was studied intensively and compared with K42. It is identical with K42 in time of flowering, earhead formation at blooming and in grain size. It is most probable that the variety from Gulsund was K42.

Synthetic Material.

5. (*i*) *New early strains.*—Some of the isolated strains from "401" are very high yielding. Purification of these is in progress.

(*ii*) *Crosses.*—The F_3 generations of the crosses between K42 and K226 and B52, and between Patni 6 and K79 were grown during the year. During the summer an attempt was made to obtain an additional generation of the cross P6 × K79 and K42 × Krishansal. Some seed from each has been obtained. Both, F_4 and F_5 generations, will be grown next year.

Selection Material.

6. (*i*) *Bhadas.*—A number of selections from bulk samples have been made, and will be grown next year.

(*ii*) *Zinya.*—Twenty-eight best selections in this variety have been obtained and will be tested in row replications next year.

District Trials.

7. (*i*) *Gujarat.*—The early strain K184 was tried in Dholka taluka, but was not superior to the local variety.

(*ii*) *Konkan.*—Comparative trials of K42 and K226 were undertaken in South Thana and North Kolaba. The results are summarised in the table below.

TABLE I.

Yield trials of K42 and K226 in South Thana and North Kolaba during the year 1933.

Strain.	North Kolaba.						South Thana.		Mean yield per acre.
	Karjat.		Panwel.		Pen.				
	1	2	3	4	5	6	7	8	
K42 ..	954	3,074	2,372	1,299	2,164	3,488	2,240	2,450	2,255
K226 ..	1,066	2,400	2,140	1,414	746	3,241	2,120	2,500	2,053

It will be seen that out of eight comparisons K42 outyields K226 at six places, and on average gives 200 lbs. of grain more per acre.

(*iii*) The midlate strain K540 was compared in Palghar and Dahanu talukas of Thana. It has given yields from 2160 to 2688 lbs. per acre. The strain has found immediate favour with the cultivators and bids fair to replace the early K401 and the course midlate strain K153.

Seed Distribution.

8. In consultation with the Deputy Director of Agriculture, N. C. D., Nasik, it has been decided that the Deputy Director, N. C. D., should ask the other divisional Deputy Directors and Taluka Development Associations of their requirements before end of March every year.

During the year under report 1420 lbs. of seed of various strains of Kolamba was supplied to the Deputy Director of Agriculture, N. C. D., Nasik.

WHEAT BREEDING.

Season.

9. The total rainfall at Niphad amounted to 38·62 inches from April 1933 to March 1934 and was about 8 inches more than the normal. Due to excessive rains in August and September the bajri crop was spoiled and did not yield well. Similarly, on account of successive cold waves in the second half of January 1934, the wheat crop was much affected and gave very low yields. Due to these main causes the season proved to be unfavourable to both bajri and wheat crops.

Replication of Improved Strains.

10. *Varietal trials.*—The four Bansi strains 103, 162, 168 and 224 and the two Bansipalli strains 808 and 809 were replicated in Latin Square with Pusa 4 and the Niphad local. The climatic conditions being unfavourable the stand of the crop was not impressive. The

results, however, show significant differences. The Bansi strains 103 and 162 are significantly superior to others, while 808, 809 and Pusa 4 are significantly inferior. The strain 808 being the earliest maturing strain was badly affected by successive cold waves appearing at the time of grain formation.

The following are the grain yields per acre of each strain.

TABLE II.

Yield per acre of Wheat Strains in Replication during 1933-34.

Strains ..	103	162	168	224	Local	808	809	Pusa 4
Yield in lbs. per acre ..	475	463	417	408	400	311	303	266

The Latin Square trials will be continued a year more.

Synthetic Material.

11. (*i*) *Bansi* × *Khapali.*—From the crosses of Kala Khapli 568 and Bansi 162 and 167 twenty morphologically pure breeding strains were obtained during the year. These were compared in row replications with 808 as a check. Only two of the synthetic types show promise. The trials will be continued.

(*ii*) *Baxi* × *Khapli.*—During the year it was also possible to obtain morphologically pure breeding types from the cross between Kala Khapli and Baxi 33. Two of the selections are promising. They will be compared next year with Baxi 33.

(*iii*) *Natural crosses.*—Some natural crosses are also being exploited to obtain higher yielding types.

Composite crosses between Baxi and Bansipalli strains have been made with a view to transfer the luster of Baxi to Bansipalli types.

Seed Grading.

12. Grading of seed is an important item in the propaganda of the Department. Well conducted experiments are, however, necessary to decide whether the seed of a particular crop should be graded (sieved) and whether such procedure results in significant increases, which are often claimed. Accordingly the improved Bansipalli 808 was taken up for this experiment.

The grain of 808 was sieved and separated into large and small seeds. The average number of grains per gram in the Big, Small and Unsieved lots was 19·44 33·62 and 20·96 respectively. The laboratory test showed 100 per cent. germination of the Big seeds and 99 per cent. of the Small and the Unseived material.

The lots were randomized four times in plots of 1½ gunthas. The seed rate was adjusted so that equal number of seeds could be sown. The yields per acre were 483 lbs., 435 lbs. and 453 lbs. for Big, Small and Unseived respectively. Although the Big grained lot gives higher yield, the difference is not significantly superior to others. The trial will be continued.

District Trials.

13. (*i*) *Nasik.*—The Bansipalli strains 808 and 809 and the Bansi 168 were compared with local at four places in the Nasik district. The results, on the basis of yield per acre are shown in the following table :—

TABLE III.

Trials of Improved Wheat Strains in the Nasik District during 1933-34.

Village.	Taluka	Yield per acre in lbs.			
		808	809	168	Local
Dharangaon	Sinnar	595	570	..	520
Vinchur	Niphad	640	..	650	560
Pimpalgaon	Do. ..	560	..	604	600
Rawalas	Do. ..	680	..	712	672

The improved strains show higher yields than the local. The strain 808 is the earliest of the three, and has superior grain. It fetches Rs. 1 to 2 more per 240 lbs. This strain has proved definitely superior to local in the Nasik district, hence its spread is being organised on a large scale.

(*ii*) *East Khandesh.*—At Mamurabad, near Jalgaon, Bansi 224 has yielded, on average, 797 lbs. per acre as compared to the average 500 lbs. of the local. The strain also fetches a premium of Rs. 2 to 3 per "Map" of 700 lbs. The strain has spread to the extent of 400 acres in Jalgaon and 100 acres in Erondale taluka.

(*iii*) *West Khandesh.*—The Bansi strain 168 has been found suitable in West Khandesh. The results of this year's trials are given in the table below :—

TABLE IV.

Trials of Improved Wheat Strains in West Khandesh during 1933-34.

Village.	Taluka.	Yield per acre in lbs.		
		162	168	Local.
Shinde	Nandurbar ..	540	564	450
Shahada	Shahada ..	834	912	872
Manrad	Do. ..	562	492	546
Pimprad	Do. ..	412	414	344
Average ..	....	587	595	553

It will be noted that the strain 168 is as good yielding as 162. In addition, it has better grain colour and luster. The trials will be discontinued and only strain 168 will be spread in the West Khandesh.

(*iv*) *Gujarat.*—The strain 224 has been spreading in the Bhal tract of Gujrat. Lately, however, this strain is said to be disliked due to its reddish tinge in grain.

During the year the two Bansipalli strains 808 and 809 were tried. The former was equally good yielding and fecthed higher prices due to better grain quality. The trials will be continued.

(*v*) *Dharwar.*—The trials were vitiated due to the attack of rust.

Bajri Breeding.

Selection Material.

14. The selection material during the year consisted of 105 new selections, 27 from Dhulia and 50 from Poona. The last lot being of red sheathed types. In addition to these a number of new selections have been obtained from Devthan and Virgaon villages in Ahmednagar district.

Uniformity Trials.

15. An acre of field of strain 54 of Bajri was cut up into 80 rectangles each 33′ by 16½′. The data were analysed by combining plot yields in various ways to obtain information as to the appropriate and convenient size and shape of plot. After eliminating the soil effects it was found that as the size of the plot increases standard error decreases. This is true when either the width is increased, keeping the length constant, or when the length of a plot is increased with width kept constant. The exception to this general trend is seen in very long and narrow blocks which show large standard errors. The data are being analysed further.

Replications of Bajri Strains.

16. (*i*) *Trials at Niphad.*—In a eight by eight Latin Square Niphad local and Akola were significantly superior over the Poona strains, and their various combinations. The calculated yields per acre are shown in Table V.

(*ii*) *Trials at Virgaon.*—The Niphad local, Akola and Poona strains were compared in a Latin Square at Virgaon. Unfortunately the field was very uneven resulting in a very gappy stand. The results are statistically insignificant.

Table V.

Calculated acre yields in lbs. of Bajri varieties replicated at Kundewadi and Virgaon during the season, 1933-34.

Variety.	Niphad.	Akola.	57	37	54	54×59	F_1 Mix.	Mixture.
Kundewadi..	476·75	473·75	323·75	241	272·5	315·25	314·75	268·25
Virgaon ..	415	439	361	334	340	..	..	..

Botanical Study of Bajri Varieties.

17. The Poona strains 54, 37 and 59 were compared with the Akola variety. The results are summarised as follows:—

(1) All the strains show more or less the same morphological composition as Akola; (2) all the strains show chlorophyll deficient plants, either whites or lethal yellows; (3) Akola is the latest to flower, (4) has a higher number of nodes, (5) is taller than 54, (6) has the same peduncle length as others, (7) has a shorter and thinner earhead than 59, (8) has higher yield than 54 only, (9) it does not show more yield of straw per plant, (10) and has thicker straw than 54 and 37. It is as variable in grain size as other strains. The strain 59 resembles most in this respect. Akola has a larger final stand, i.e. has a smaller mortality than any other strain.

The last fact is of considerable importance in yield trials. Due to heavy mortality the total number of plants in Poona strains is much less than in Akola. This would directly affect the yield. During the ensuing season preliminary studies in this respect will be made.

Gram Breeding.

Selections.

17. Fresh material was added this year for selection. Unfortunately due to the incidence of cold waves the crop suffered rather badly. More new material will be added next year for selection.

The local gram is a mixture of many types. The plants showing colour in stems were earlier than green plants. These plants escaped the effect of cold. From the local, white flowered plants were obtained during the last two years. These are entirely green and bred true.

Seven Pusa types were compared in rows with the local. They were very late, and yielded low.

Miscellaneous.

Selection in "Rala" and "Kulathi".

18. These two crops are grown mixed with Bajri. In both, various types of mixture are found. Some promising selections have been obtained in *Rala*.

Selection in Linseed.

19. Bulk samples from various parts of the Bombay Presidency and improved strains from other Provinces were grown during the year. Most of this material was collected by the Economic Botanist to Government, Poona. Promising selections have been sent to him for further investigation at Poona.

Wheat Rust.

20. Stationary slide exposures were made from September 1933 to February 1934. The slides were sent twice a week to the Plant Pathologist to Government, Poona, who later transmits them to Dr. K. C. Mehta, Agra, for further study.

Publications.

21. *Kadam, B. S.*—A Specific Colour Inhibitor Gene in Rice, Current Science ; 2 (7) 246, 1934.

Kadam, B. S.—Inheritance of Root Colour in Rice : (Abstract), 21st Indian Science Congress, Agricultural Section, 11, Bombay, 1934.

Kadam, B. S. and G. G. Patil.—Blooming and Anthesis in Kolamba Rice. Indian Journal Agricultural Science, 3 (4) : 577–588, 1933.

Kadam, B. S., and G. G. Patil.—Natural Cross-Fertilization in Rice : Agricultural College Magazine 25 : (2), 53–69, 1933.

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Karjat.

August 1934.

Summary of publications contributed by the section of the Crop Botanist to Government of Bombay, Karjat, during the Year 1933–34.

Kadam, B. S.—

A Specific Colour Inhibitor Gene in Rice, *Current Science*, 1934, II, 246.

In a cross between an entirely green and a purple variety the F_1 was green leaved with red sheath. In F_2 segregation of green and purple leaved plants occurred in 13 : 3 ratio. Subsequent F_3 studies substantiated the F_2 observation. The action of a major gene, producing anthocyan pigment all over the plant, is masked in the leaf region by an inhibitor resulting in plants with red sheath, but with green leaves. When the inhibitor is absent the plants are full purple.

Kadam, B. S.—

Inheritance of Root Colour in Rice ; *Proc. 21st Indian Sci. Congress*, Agric. Sec. II, Bombay, 1934.

A Burmese variety develops anthocyan pigment on roots when exposed to solar radiation. The character is governed by two genes, A and R_0, whose simultaneous presence is necessary to produce colour on roots.

Kadam, B. S., and Patil, G. G.—

Blooming and Anthesis in Kolamba Rice. *Indian Journ. Agric. Sci.*, 1933, III, 577.

A number of pure lines of Kolamba rice were observed. Flowering in a panicle begins on the second day after emergence and progresses from top downwards. The spikelets bloom in regular sequence in a sub-branch. Usually the terminal spiklet opens first, followed by the second ; from here on flowering continues upwards. Various strains showed differences in the magnitude of blooming at different hours. Blooming is vigorous between 9 a.m. and 12 noon. After 12 noon there is a rapid fall and hardly any flowers open in the afternoon. Three distinct phases were observed in anthesis, (1) time required to open, (2) duration a flower remains completely open, and (3) time required to close. All the phases are greatly influenced by climatic conditions.

Kadam, B. S. and Patil, G. G.—

Natural Cross-fertilization in Rice. *Agricultural College Magazine*, 1933, XXV, 53.

Extent of natural crossing at Karjat was determined in a number of varieties during the year 1931 and 1932. The incidence varies from *nil* to 4·306 per cent. The average is about half a per cent. The amount of natural crossing is so low that it is not necessary to bag plants to produce seed for multiplication.

Programme of Work under the Crop Botanist to Government, Karjat, for the year 1934-35.

Rice Breeding.

(1) Replication of improved strains—
  (*a*) Mid-late Kolamba strains.
(2) Selection in Bhadas,
(3) Selection in Zinya,
(4) Selection from the hybridized material—
  (*a*) Purification of early synthetic strains,
  (*b*) F_4 selections from K 79 × P6
  (*c*) F_4 selections from B 52 × K226
  (*d*) F_4 selections from B 52 × K42
  (*e*) F_4 selections from K 42 × K226
  (*f*) Selections from other combinations.
(5) Studies in the inheritance of agronomic and morphological characters in rice.

Val Breeding.

(1) Selections in *Val*.

Wheat Breeding

(1) Replication of improved wheat strains.
(2) Selection in the hybridized material—
  (*a*) Selections from Bansi-Khapali crosses,
  (*b*) Selections from Baxi-Khapali crosses,
  (*c*) Selections from natural and other crosses.
(3) District trials in Nasik, Gujarat and Dharwar.
(4) Studies in the inheritance of character in the Bansi wheat.

Bajri Breeding.

(1) Inbreeding and selection in Bajri.
(2) Comparative Study of Akola, Niphad local and Poona strains.
(3) Uniformity trials of Bajri.
(4) Varietal trials of various Poona strains, their mixtures, Akola and Niphad local.
(5) Determination of incidence of mortality in Poona strains, Akola and Niphad local.

Gram Breeding.

(1) Selections in gram.

Miscellaneous.

(1) Selections in "Rala" and "Kulathi".

B. S. KADAM,
Crop Botanist to Government.

APPENDIX K.

Summary of Work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the Year 1933–34.

Dr. B. N. Uppal held charge of the section until 12th June 1933, when he proceeded on a leave of absence for one year to study the latest advances in our knowledge of the virus diseases of plants. The cost of the deputation was met from a grant of £500 made to the Government of Bombay by the Imperial Council of Agricultural Research. In England Dr. Uppal spent most of his time at the Rothamsted Experimental Station, and in America at the Rockefeller Institute for Medical Research and at the University of Wisconsin. He was also able to visit Egypt and the Sudan to study wilt and leaf curl in cotton, the cost of this journey being met from a grant from the Indian Central Cotton Committee. Dr. M. K. Patel acted as Plant Pathologist during the absence of Dr. Uppal on leave.

Mr. M. N. Kamat returned from leave on 12th June 1933 and was appointed to act as Assistant Professor of Mycology *vice* Dr. M. K. Patel.

Mr. K. G. Kolhatkar continued to act as Assistant Mycologist *vice* Mr. Kamat.

Mr. J. S. Malelu continued to work as Betelvine Investigator with headquarters at Bassein.

Mr. V. P. Gokhale was appointed from 6th November 1933 to the temporary post of Graduate Assistant in the Small Leaf Disease of Cotton under the Indian Central Cotton Committee.

Mr. N. T. Kulkarni continued to work as Sann Investigator in the Sann Wilt Scheme financed from the funds of the Sir Sassoon David Trust Fund.

Education.

The Plant Pathologist to Government was assisted by the Assistant Professor of Mycology in the teaching of plant pathology at the College of Agriculture.

There were two students specialising in the course on Advanced Plant Pathology, and both of them were successful in the University Examination for the degree of Bachelor of Agriculture. The two post-graduate students continued to work on their problems during the year.

Research.

1. *Wilt in betel vines.*—The number of plots treated with Bordeaux mixture 2–2–50 at the rate of 1½ gallons per *haral* was 98. In about 90 per cent. of these plots the disease was completely controlled, about 1·5 per cent. were affected to the extent of 1 to 10 per cent., and about 8·5 per cent. plots showed infection over 10 per cent. A large proportion of the neighbouring untreated plots was completely destroyed.

Drainage and the use of sann hemp as a green manure are being advocated to improve the condition of the soil and to facilitate the penetration of the fungicide below the surface during the monsoon.

The following modifications in the methods of lowering vines before the monsoon have been successfully tried: (1) stretching vines full length without coiling, (2) placing the coil horizontally instead of vertically in the soil, and (c) burying only half the coil so as to keep it within an easy reach of the fungicide.

2. *Fusarium wilt in sann-hemp.*—The strain D–IX selected last year has maintained its wilt-resistant character; but the germination of the seed of some of the progenies was extremely poor owing to continuous selfing. For example, out of 67 seed of D-IX-2 dibbled in a heavily wilt-infected bed, none germinated. Another batch of 30 selfed seed was then placed in a sterilised Petri dish lined with wet cotton and kept at 30° C.; only two seeds germinated, and the seedlings were transplanted to pots. The progenies of strain D-IX have been selfed, sib-crossed or crossed with another member, and the seed produced in each case will be tested under the optimum conditions for wilt resistance in soil temperature tanks.

After the second year the selfed progenies have shown considerable sterility and loss of vigour. During the year the progenies have therefore been sib-crossed or crossed with another member of the strain, and the seed produced is well filled and looks normal. It is thus hoped to restore fertility and vigour of the progenies without affecting their capacity to resist wilt.

Histological studies have shown that in selfed flowers which failed to produce seed, the pollen tubes did not reach the ovary to effect fertilisation.

Experiments on the longevity of pollen stored at different temperatures have shown that at ordinary room temperatures (about 82°F.) the pollen was not viable for more than two days, whilst comparatively low temperatures (56°F.) prolonged its life to six days.

Out of 8,413 seeds collected from diseased plants and germinated in a sterile Petri dish lined with wet cotton wool, only 148 seedlings showed the disease. This evidence will be further tested to show whether the fungus is borne as internal mycelium within the seed.

3. *Powdery mildew of peas.*—Evidence was produced last year that *Erysiphe polygoni* perennates as dormant mycelium in diseased seed. It has also been found that in certain localities such as Mahableshwar the fungus persists in the conidial stage because of cool weather conditions prevailing there during the summer months. The quantity of sulphur required to control mildew at Mahableshwar was slightly in excess, i.e. 27 lbs. of the quantity used at Poona and Saswad.

4. *Alternaria blight of cumin.*—The fungus causing blight in cumin has been found to over summer in the fields on stubble; laboratory tests made at Poona have confirmed the field experiments. The spores of the fungus remain alive for at least 1½ months when kept dry, but they fail to germinate in an atmosphere of 100 per cent. humidity.

5. *Fig rust.*—" Bouisol ", " Sulsol ", Bordeaux mixture and sulphur were tested during the year. " Bouisol " and " Sulsol " were decidedly superior to the other two fungicides and had also the advantage of being harmless to the leaves, which are injured both by sulphur and Bordeaux mixture. Further tests will be made next year.

During the last two years, late rains and aphis have seriously interfered with experiments on the control of fig rust.

6. *Sclerotium rolfsii in potatoes.*—" Kerol " was tested for the control of the disease caused by *Sclerotium rolfsii* in potatoes on the Dharwar Farm. The fungicide was applied at intervals of 7,15 and 30 days at dilutions of 1 in 400, 1 in 800 and 1 in 1,200. The dilution of 1 in 400 was too strong and caused the death of many plants and also affected the growth of such plants as escaped injury. The dilution of 1 in 800 also caused some deaths, but it increased the yield over the check. The dilution of 1 in 1,200, however, gave very satisfactory results, as it increased the yield without causing injury to plants.

The promising results obtained with " Kerol " will be further tested next year.

7. *Macrophomina phaseoli.*—This fungus was isolated from 7 new hosts, thus making a total of 17 hosts in this Presidency. The damage in the case of jowar is the reduction of the size of the earhead, which generally weighs about one-fifth of the normal. In the case of linseed and cotton the parasite can cause death of the hosts at any stage of their growth, provided suitable conditions of soil moisture and temperature are provided.

The disease in jowar (known as " *Kharkharia* ") is also influenced by the type of soil: it is prevalent in the river bed of Narmada, but is absent on the Broach Farm, hardly about three-fourths of a mile distant from the river.

The results on cross inoculations have so far been negative. The strain of the fungus on jowar from the Mohol Farm produces the pycnidial stage, and this capacity is lacking in the strain obtained from the diseased plants at Broach.

8. *Small Leaf Disease in Cotton.*—A survey made in the cotton growing areas in the Presidency has shown that this disease is of widespread occurrence and causes serious damage to cotton; the attack, however, varies in severity from year to year. The important symptoms are reduction in size of leaves and sterility in affected plants. The preliminary investigation has shown that the disease is either a teratological manifestation or of virus origin. In the Kaira district cotton plants which are free from the disease in the first year become badly diseased in the first and second ratoons; this evidence suggests that the disease may belong to the virus category.

The disease has not yet been transmitted by insects or by grafting. Experiments in this direction are being continued.

9. *Gummosis of citrus.*—An investigation into *Phytophthora palmivora*, the cause of the gummosis of citrus in this Presidency, has been completed. The results are being written up for publication.

10. *Powdery mildews.*—Endophytic powdery mildews were collected on several new hosts such as *Dolichos lablab*, *Oxalis cymosa*, *Euphorbia geniculata*, Nasturtium and *Trigonella foenum-graecum*. An interesting observation was made that the mildew on *Dolichos lablab* was different in its conidial measurements from that on the other hosts, which latter was probably *Oidiopsis taurica*. The *Dolichos* mildew had conidia and conidiophores much larger than those of *Oidiopsis taurica*.

Cross-inoculation experiments have been made, and the germination of conidia has been studied. Further work is in progress.

11. *The Fungi of Bombay.*—An up-to-date list of the fungi of Bombay has been prepared, and will soon be published as a departmental bulletin.

Advisory work.

A large number of enquiries on plant diseases were dealt with during the year, and advice was given promptly whenever required.

Arrangements to demonstrate specimens of plant diseases and the appliances for their control were made, as usual, at the agricultural shows in collaboration with the Divisional Deputy Directors of Agriculture.

The work on the disease survey of the Presidency was continued during the year.

Miscellaneous.

A set of Soil Temperature Tanks has been installed at the College of Agriculture, Poona, to study the relation of soil temperature to diseases caused by soil-borne fungi. These tanks are at present being used for the production of wilt-resistant strains of sann-hemp.

Necessary facilities were provided to Dr. K. C. Mehta for making stationary slide exposures at five stations in the Bombay Presidency, in connection with his studies on the dissemination of wheat rusts in India.

The following fungi have been recorded for the first time in the Bombay Presidency :—

Peronospora effusa on *Chenopodium album.*

Peronospora trifoliorum on *Medicago sativa.*

Oidium erysiphoides on *Crotalaria juncea.*

Peronospora parasitica on *Raphanus sativus* var. *caudatus.*

Uromyces fabae on *Lathyrus odoratus.*

Erysiphe polygoni on *Lathyrus odoratus.*

Phytophthora parasitica Dast. emend. Ashby on *Lycopersicum esculentum.* This parasite produces decay of tomato fruit.

Publications.

1. UPPAL, B. N.—The effect of dilution on the thermal death rate of tobacco mosaic virus. *Indian Jour. Agr. Sci.* (In press.)
2. UPPAL, B. N.—The absorption and elution of cucumber mosaic virus. *Indian Jour. Agr. Sci.* (In press.)
3. UPPAL, B. N.—The movement of tobacco mosaic virus in leaves of *Nicotiana sylvestris*. *Indian Jour. Agri. Sci.* (In press.)
4. UPPAL, B. N.—Diseases in the Bombay Presidency. *Internat. Bull. Plant Protect.* 7 : 103. 1933.
5. UPPAL, B. N.—Plant Diseases in the Bombay Presidency. *Internat. Bull. Plant Protect.* 7 : 187. 1933.
6. PATEL, M. K.—Diseases in the Bombay Presidency. *Internat. Bull. Plant Protect.* 7 : 246. 1933.
7. PATEL, M. K.—Diseases in the Bombay Presidency. *Internat. Bull. Plant Protect.* 8 : 98. 1934.
8. STEVENS, F. L., AND A. S. PEIRCE.—Fungi from Bombay. *Indian Jour. Agr. Sci.* 3 : 912-916. 1933.
9. Control of Powdery Mildew of Peas. *Bombay Dept. Agri. Leaflet No.* 5 *of* 1933.

B. N. UPPAL,
Plant Pathologist to Government.

Abstract of papers published during 1933–34.

(1) UPPAL, B. N.

The movement of tobacco mosaic virus in leaves of Nicotiana sylvestris. Indian Jour. Agri. Sci. (In press).

The writer has shown experimentally that ordinary tobacco mosaic virus passed from the upper into the lower epidermal cells in sufficient concentration to be detected 36 to 40 hours after inoculation of a well-developed leaf of *Nicotiana sylvestris*. The time taken by the virus to travel from the epidermis to the mesophyll below was about 4 hours. Considering the thickness of the leaf of *Nicotiana sylvestris* as 275 μ on an average, the rate of the spread of the virus by diffusion in the leaf tissue was roughly 7 to 8 μ per hour.

(2) UPPAL, B. N.

The effect of dilution on the thermal death rate of tobacco mosaic virus. Indian Jour. Agri. Sci. (In press).

The effect of dilution on the thermal death-rate of ordinary tobacco mosaic virus was determined by means of the local lesions method. The virus was inactivated in 10 minutes at a temperature between 86 and 87° at a dilution of 1 in 10, between 82 and 84° at 1 in 100, and between 77 and 78° C. at 1 in 1000. The thermal death-point of the virus was close to 70° C. at a dilution of 1 in 10,000.

(3) UPPAL, B. N.

The absorption and elution of cucumber mosaic virus. Indian Jour. Agri. Sci. (In press).

The writer has shown that the cucumber virus extract was rendered non-infectious after passage through a sand-and-pulp filter or a bed of Fuller's earth, and that the virus was also readily absorbed by Kaolin or Fuller's earth, added in the proportion of 0·125 gm. to 100 c.c. of the filtered juice of diseased leaves. The cucumber mosaic virus was active only within a rather narrow range of pH, i.e., about 5-9, since hydrogen-ion concentrations greater than pH 5 inactivated the virus. The virus absorbed by Kaolin or Fuller's earth was freed from the latter by changing the pH of the suspension to the acid side, i.e., pH 6-6. 7. Elution was not possible by dilute ammonia solution, which, however, did not inactivate the virus since a change in the reaction of the suspension treated with ammonia solution to pH 6·7 freed the virus *in vitro* in an active state.

(4) STEVENS, F. L., AND A. S. PEIRCE.

Fungi from Bombay. Indian Jour. Agri. Sci. 1933, III, 912.

Out of 66 specimens of fungi sent from Bombay for identification, 40 were examined. Of these 40, the following species have been described as being new to science:

Chaetothyrium pongamiae, Harris on *Pongamia glabra* Vent.; *Physalospora pandani*, Stev. and Peir. on *Pandanus* sp.;

P. psidii, Stev. and Peir. on *Psidium guajava* L. ; *Septoria prosopidis*, Stev. and Peir. on *Prosopis juliflora*, D. C. ; *Oidium cococarpum*, Stev. and Peir. on *Cocos nucifera* L. ; *Cercospora ixorae*, Sol. on *Ixora coccinea*. L.; *Corynespora colebrookiae*, Sol. on *Colebrookia oppositifolia* Sm. and *Illosporium hibisci*, Stev. and Peir. on *Hibiscus esculentus*. L.

Of the remaining, several are reported for the first time in the Bombay Presidency.

(5) Uppal, B. N.

Diseases in the Bombay Presidency.—Internat. Bull. Plant Protect. 1933, VII, 103.

The writer reports plant diseases new to the Bombay Presidency.

(6) Uppal, B. N.

Plant Diseases in the Bombay Presidency. Internat. Bull. Plant Protect. 1933, VII, 187.

The writer reports plant diseases new to the Bombay Presidency.

(7) Patel, M. K.

Diseases in the Bombay Presidency. Internat. Bull. Plant Protect. 1933, VII, 246.

The writer reports plant diseases new to the Bombay Presidency.

(8) Patel, M. K.

Diseases in the Bombay Presidency. Internat. Bull. Plant Protect. 1934, VIII, 98.

The writer reports plant diseases new to the Bombay Presidency.

Programme of Work under the Plant Pathologist to Government for the Year 1934-35.

(1) *Wilt in betel vines.*—Experiments on the improvement of soil by drainage and other methods will be continued.

The number of treatments necessary for the second year crop will be determined.

Propaganda work will be pushed on vigorously.

(2) *Sann Wilt.*—(*a*) To determine optimum conditions for the development of wilt in sann hemp, (*b*) testing wilt-resistant strains under optimum conditions for the production of wilt, (*c*) to determine whether the fungus is borne in the seed as internal mycelium.

(3) *Macrophomina phaseoli in jowar.*—(*a*) The relation of soil temperature to infection in jowar will be determined in soil temperature tanks, (*b*) cross-inoculation experiments will be continued, (*c*) studies on the fungus will be continued.

(4) *Sclerotium rolfsii in potatoes.*—"Kerol" in strengths of 1 in 800 and 1 in 1200 will be further tested during the year.

(5) *Powdery mildews.*—Studies on endophytic powdery mildews will be continued, especially the mildew occurring on *Dolichos lablab.*

(6) *Fig rust.*—(*a*) Tests with "Bouisol," "Sulsol," Bordeaux mixture and sulphur will be continued, (*b*) Three variations in pruning to be tested: no pruning, May pruning and October pruning, (*c*) Roots will be exposed in one series of experiments according to the cultivator's method and in the other series late in October.

(7) *Small leaf disease in cotton.*—(*a*) Experiments on transmission will be continued and extended, (*b*) experiments will be made to determine the spread of the disease under field conditions and its behaviour in ratoon crop.

(8) *Alternaria blight in cumin.*—(*a*) Control methods will be worked out, (*b*) histological studies of affected plants will be made.

(9) *Bacteriophage.*—Work will be continued.

B. N. UPPAL,
Plant Pathologist to Government.

APPENDIX L.

Summary of Work done under the Live Stock Expert to Government for the Year 1933–34.

Personnel.—This Section was under the control of Mr. H. G. Baluch from the 13th April to the 14th December 1933 during the absence on leave of Mr. Edw. J. Bruen, who on return from leave resumed charge of the work. There was no addition to staff during the year. There were, however, a number of changes due to leave and sickness among the staff, the work consequently suffered to a certain extent.

The livestock work of the Presidency had a most auspicious year, Sir Frederick Sykes, late Governor of Bombay taking a keen interest in this side of the Agricultural Department's activities. Almost all Cattle Breeding and Dairy Farms of any consequence were personally inspected by His Excellency; Cattle Stables and Dairies in Bombay were visited. His Excellency was pleased with all he saw. His Excellency's visit has created a greater interest among those who had the pleasure and good fortune to meet him.

The activities of this Section mainly are :—

(*i*) Advisory work.

(*ii*) Propaganda and teaching in villages.

(*iii*) The breeding of pure bred stock and their improvement on Government and private cattle breeding farms.

(*iv*) The breeding and improvement of poultry at the Government Central Poultry Farm, Kirkee, and other private and Government aided institutes.

(*v*) The improvement of the cattle in villages by placing out pure bred Premium bulls.

(*vi*) The improvement of village poultry by placing out improved stock in the shape of cocks and hens into villages.

(*vii*) The encouragement of keeping better stock by holding Shows, Rallies and Demonstrations.

(*viii*) Improvement of Milch buffalo.

(*ix*) The registration of pure bred stock of the various breeds in Breed Herd Registers.

(*x*) Propaganda in the storage and utilization of fodder in the form of hay and silage.

(*xi*) Conducting Nutrition experiments on Livestock and Poultry.

(*xii*) Supply of pure bred cattle and poultry to would be breeders on very encouraging rates to cultivators.

(*xiii*) Advice on the feeding and care of cattle, sheep, goats and poultry.

Advisory Work.—Advisory work consists of visiting villages, private farms, etc. and helping with the alteration or addition to farms when necessary, the feeding, care and general management of farms, the

inspection of sites for all farms of livestock, farming schemes and the drawing of plans and estimates for such, the postal advisory work on the care and feeding of livestock.

Revised Schemes for research in Poultry and Goats were submitted to the Provincial Agricultural Research Committee for submission to the Imperial Council of Agricultural Research for financial assistance.

Propaganda.—The district propaganda work suffered for 6 months owing to changes in staff. The time lost was later made up by extensive work. Propaganda in the keeping of better cattle, poultry etc. and the great necessity of better care was conducted by visits to villages, at demonstrations, shows, Taluka Development meetings and village or social Panchayat meetings. During the year, in the South Central Division actual classes in Animal Husbandry were conducted at short courses held by the Village Improvement Committee, Sholapur, and the District Agricultural Association, Satara.

The propaganda for the registration of pure bred cattle is now bearing fruit, this year large numbers have been registered and the people are fast realizing the great benefit derived from this type of work.

The agriculturist is now beginning to realize the great benefits derived by keeping good economical cattle as a side industry to his farming. The keeping of good cattle and buffaloes is decidedly on the increase.

Poultry keeping is also making headway. Due to the spread of better poultry the necessity of having a small staff which can devote its time to this side of agriculture is being keenly felt. Timely advice on breeding, feeding, care and measures taken to ward off disease is very necessary at present. Poultry keeping is a new cottage industry of which the people know little or nothing and it is essential that they be put on sound lines in the beginning. A marked increase in size of the village egg may be noticed in all markets.

The table given below shows the progress made in each division in number of Premium bulls now working, shows and demonstrations held, tattooing carried out etc. This statement is itself explanatory and shows the marked increase in the activities of the district work :—

Description.	1932–33	1933–34
Premium Bulls—		
South Central Division	41	50
North Central Division	50	55
Southern Division	39	49
Northern Division	55	65
Total ..	185	219
Cattle Shows, Rallies and Demonstrations	21	24
Number of animals tattooed and registered	316	1,478

It is very nearly impossible to gauge the amount of good done by this Section. In the Southern Division, villages may be seen possessing many good cattle bred in the village, which at one time possessed an ordinary village stock. The villages we are working in are getting self-contained regarding their bullock supply. The breeding areas in Sholapur District are now supplying other Districts with pedigree bulls bred in this area.

General.—All the staff have worked well and willingly, and great credit is due to them. I was pleased to notice on my tours that all the Divisional Inspectors are now being recognised as experts in their line, villagers relying considerably on their judgment in buying bullocks, cows and buffaloes. This itself speaks volumes of the work they are doing.

Northcote Cattle Farm, Chharodi.

Personnel.—Mr. M. M. Desai held charge of the farm with the exception of the period from 9th June 1933 to 21st December 1933 when Mr. B. B. Jamaspjina, Assistant Manager, held charge. Mr. Desai during this period relieved Mr. A. K. B. Cazi, Nutrition Assistant. Mr. M. G. Patel acted as Assistant Manager of the farm in addition to his own duties as Divisional Inspector of Cattle Breeding during the absence of Mr. Desai.

Season.—The season as a whole was a good deal more variable than the preceding year. Very high temperatures were recorded in June. Heavy rains fell in July and August, there being 43 wet days as against 44 the year previous.

The year on the whole was hotter, for 9 months of the year, over 100° F. being recorded with a minimum of 70° F. for 10 months. Again owing to heavy rain the farm was water-logged.

Crop (Monsoon).—For cultivation the season was, if anything, bad. Rain was registered towards the end of June, when crops were sown, this was followed by a dry spell up to the middle of July, which gave the sown crops a set back; this was then followed by heavy rain over a long period. Late season jowar could not be sown. Farming operations were also hampered by the appearance of Foot and Mouth disease amongst the working cattle. Again the winter was severe, which retarded winter crops a good deal.

Silage.—During the year 483,866 lbs. of silage were made with a balance of 73,134 lbs. of the year previous; thus the farm had on hand 557,000 lbs. of silage.

Jowar.—The principal crop of the farm is Jowar. This crop was put down on 37·15 acres, the result obtained being 134,547 lbs. of green Jowar for silage, 54,034 lbs. dry kadbi and 5,410 lbs. of grain.

Maize.—This crop was sown both as a monsoon and irrigated crop. In all 10·32 acres were put down to Maize. Owing to water-logging the crop did not do well and became very weedy, as it was not possible

to enter the fields for weeding operations. The yields from this crop were :—

Monsoon Maize	..	.. 117,852 lbs. all silaged.
Irrigated (Autumn and Spring)	..	24,131 lbs. fed green.

Bajri.—This, as with the other crops, suffered from the excessive rain, 4 acres yielding 6,935 lbs. kadbi with 1,010 lbs. grain.

Elephant Grass.—A small plot measuring 10 gunthas, this has been a good stand-bye for green fodder in the winter yielding 5,000 lbs. in 9 cuttings.

Soya Bean.—This crop was grown for the first time on the farm and from this year's experience if it grows well, a larger area must be put down to this crop. Two varieties Brown and Yellow were tried.

From a 20-guntha plot 98 lbs. seed and 392 lbs. hay were obtained.

It was found that this crop remained green long after other monsoon crops had dried off, thus filling in a gap between monsoon grown green fodder and winter irrigated fodder.

This crop will again be tried.

Groundnut.—The crop was tried as a Kharif legume as a rotation crop. Some 4 acres were put down to the crop. The yields obtained were 4,144 lbs. of hay and 2,616 lbs. of nuts. The drawback to this crop lies in the harvesting. If the crop is unavoidably not inter-cultivated during the flowering stage, the land becomes so hard that only hand labour can be employed to harvest it.

Berseem.—One acre was put down to this crop, which was sown late owing to the stoppage of the pumping plant for repairs. The crop withstood two spells of frost. The yield obtained in 5 cuttings was 59,800 lbs., the last cutting being taken in April.

Oats and Peas.—Three small plots were put down to this mixture and yielded approximately 12,800 lbs. of green fodder.

Hay Making.—As in previous years only a small portion of the farm was retained for farm use, the remainder being sold. The farm harvested and stored 741,951 lbs. of hay for its own use at a cost of Rs. 1,246-2-0 or Rs. 1-10-10 per 1,000 lbs. 1 lakh pounds of hay was put, baled and stored on account of the Sir Sassoon David Trust Fund at a cost of Rs. 800.

Livestock.—The policy of improvement of the herd adopted several years back still continues, the results now being obtained are very encouraging. The breeding herd is divided into three distinct lines :—

(1) Pure bred Chharodi : In this herd breed characteristics are paid most attention to, milk being only a secondary consideration.
(2) Dual type : (i.e.) Breed character and partial milk.
(3) Milking type.

In all cases early maturity and regularity of breeding are carefully watched. The attached statement (*vide* Appendix I) will show the progress made in this breed. Thirteen heifers calved for the first time as against 19 the year previous. Sixty births were registered during the year showing a percentage of 72 per cent. as against 84 per cent. the year previous.

The in-breeding policy adopted is proving very successful. It is now hoped that we shall, with the results of this policy, be able to fix our type.

Disease.—The year started with the remains of Foot and Mouth disease from the year previous, this disease appearing once again later in the year. The nineteen deaths recorded on the farm can more or less be traced to the effects of this disease, as the greatest mortality being amongst calves born of parents having the disease and the adult deaths being from the old stock. The bullocks on the farm suffered a good deal during the year from this disease. The disease was very well handled by the acting Manager, Mr. Jamaspjina, as the type of disease was very bad in surrounding villages which claimed a number of deaths.

A strange coincidence of this disease was that a few heifers under special feeding experiment of salt licks escaped the disease although mixing with the infected herd. This will be watched in future. The year was free from Dengue fever and the scourge of biting insects so prevalent on the farm.

Sales.—During the year 52 animals were disposed of by sale giving out as Premium bulls and transfer to other Government institutes.

Premium Bulls.—During the year some 24 breeding bulls were placed out in the district as Premium bulls. These are accounted for under Propaganda.

Milking Herd.—Now that most of the cows at the farm are yielding milk, which was not the case a few years back; it has become essential now to watch our progress over the whole herd. The statement attached (*vide* Appendix II) shows the progress as usual with a new column showing average yield per cow per annum on the whole herd. The uniformity of the whole herd will be seen, there being very little difference between the average of the milk on milkers and the whole herd showing clearly how the regularity in breeding and milking is shaping up on the farm.

During the year 15 cows topped the 3,000 lbs. mark, of these 2 yielded over 6,000 lbs., 4 over 5,000 lbs. and 6 over 4,000 lbs. A Dairy herd to be really profitable has to be regular in calving and a regular yield of milk is essential. From statement (*vide* Appendix III) attached, it will be seen how uniform the daily milk out-put is due to calving being spread throughout the year.

Miscellaneous.—A number of experiments have been conducted during the year, these will be reported in the Crop Research Report for the year.

The farm is gradually being brought up-to-date although the progress is slow owing to financial stringency.

Cattle Breeding Farm, Bankapur.

Personnel.—Mr. A. B. Gadagkar, G.B.V.C., held charge of the farm throughout the year.

Seasonal conditions.—Both the ante-monsoon rains and the regular monsoon appeared slightly early in the year, this helped considerably the agricultural operations. The rain was not heavy enough to benefit the crop but was sufficient to keep implements out of the land, thus preventing inter-tilling operations. The grasses in the grass lands consequently were not as good as usual. Heavy showers in November did a good deal of damage to standing crop where a lot of lodging was experienced. The grazing was fair but the harvesting of hay was consequently poor.

The imported grasses—Gordura and Jaragway—from Brazil fared very well doing better than the local grasses, showing that they are fairly drought resistant. The other grass experiments proved very well. These will be fully reported on after another trial.

Livestock.—The breeding policy remained the same. Great progress has been made in building up a more uniform herd. We have practically surmounted the coat colour difficulty and now a uniform white and light grey type which is fancied by the people is fairly well established. We have been able to breed the dark grey, almost black out of the herd. The coverings and calvings show a distinct improvement. Some 67 animals were served during the year as against 29 the year previous; 24 animals calved as against 11 the year previous. There was a great improvement in the present standard of calves born. We have completely got over the difficulty of the pendulous sheath by selection and with future selection we should eradicate this completely out of the herd.

Early maturity.—The Statement (*vide* Appendix IV) shows how we have progressed in this direction. Heifers are now going to the bull at 2 years and 6 months of age; this I feel is a great improvement.

Farm bulls in villages.—The breeder has at last realized that pure bred bulls from the farm are far superior to purchased bulls. This is clearly illustrated in villages using farm bulls, which have progressed considerably as against villages using purchased bulls which are making very little progress.

Sales.—An auction sale was held during the year at which 10 young bulls—these being prospective Premium bulls—10 cows and 3 heifers were sold. Prices realized were better than previous years but not what was anticipated, this is due to the general depression in agricultural products. The young bulls are sold conditionally and hence cannot be expected to realize full market value.

Disease.—The farm was free of disease this year with the exception of Foot and Mouth disease. Preventive inoculation against disease has been very successful in warding off the usual occurrence of disease.

Petty Construction.—The cattle dip started the year before was completed and brought into use. Additions to calf runs were put up. An old well is in course of excavation to supplement the present water supply, a pump and engine for this was purchased.

Fodder and Cultivation.—The farm now has six semi-pucca silo pits, these were all filled. The following cultivated crops were used for silage :—

	Lbs.
Bajri	57,583
Maize	224,645
Total ..	282,228

Maize.—This is the main crop of the farm, some 9 acres were put down to this crop and which yielded over 2 lakh lbs. of green fodder. A plot measuring 1 acre and 10 gunthas was put down to Maize for seed, this yielded 3,500 lbs. of seed and 19,500 lbs. of semi-dried fodder.

Jowar.—Six acres and 20 gunthas were put down to this crop, which promised very well until the heavy rains appearing in November, which lodged the crop ; 44,095 lbs. of green fodder, 27,695 lbs. of dry fodder and 2,155 lbs. of seed were recovered.

Bajri.—A plot of 1 acre was put down to Bajri to mix with maize for silage, this produced 57,583 lbs. of green fodder.

Kulthi.—Kulthi is grown as a rotation crop to follow the kharif crop, 2 acres and 30 gunthas being sown. This crop also did very well, 2,105 lbs. grain and 4,350 lbs. chaff was harvested.

Soya Beans.—This crop was again tried this year, two varieties being sown.

Mammoth Yellow.—This crop was sown on a 20-guntha plot, owing however to pest infestation the crop was destroyed.

Large Yellow.—Eight acres and 10 gunthas were put down to this variety. This variety did exceptionally well and had it not been for the late heavy rain in November, a really bumper crop would have resulted. The yields obtained even with this damage are good. The plot yielded 6,373 lbs. seed, 12,600 lbs. of chaff, which works out to 790 lbs. seed and 1,570 lbs. chaff to the acre.

Lucerne.—A small plot of Lucerne was again grown as a semi-dry crop, which did very well. It is hoped to extend this as soon as water for irrigation is available from the new well.

General.—There has been a general improvement all round in the cattle, the farm and in keeping records.

Central Poultry Farm, Kirkee.

This farm has once again been unfortunate in its management; Mr. Zaidi, the permanent Manager, falling ill on two occasions, one—from

13th July 1933 to 2nd January 1934, during this period Mr. S. S. Khot, Divisional Inspector of Cattle Breeding, S. C. D., managed the farm in addition to his own duties, then again from 18th May 1934 to 11th July 1934, during this period Mr. A. K. B. Cazi, Nutrition Assistant, did the work in addition to his own duties. With all this the farm had a most successful hatching year, the youngstock doing exceedingly well.

Livestock.—The following poultry were imported :—

2 White Leghorn cocks and 2 hens.

3 Rhode Island Red cocks and 3 hens.

1 Australorp cock, and

1 White Wyandotte cock and 1 hen.

This new blood has done very well and their progeny proved very well. Statement (*vide* Appendix V) attached gives the average yield of the different breeds on the farm, the Goodwin Preece strain of White Leghorn topping the list.

Statement (*vide* Appendix VI) gives the results of the various Incubators. These results are a big improvement on previous years.

Statement (*vide* Appendix VII) shows the number of birds and setting of eggs disposed of and the spread of poultry in the Presidency.

Statement (*vide* Appendix VIII) shows the strength of the flock at the end of March. From this statement, it will be seen the number of chickens reared, i.e. 461, which will go into the district. We have been very fortunate this year with our youngstock ; this I put down to the use of mineral mixture and other more scientific methods of feeding introduced, which will be reported more fully in the Departmental Experimental Records for the year.

Statement (*vide* Appendix IX) shows month by month the disposal of stock.

Statement (*vide* Appendix X) shows the number of Stud Cocks put out in the district during the year.

Fodder Crop.—The farm this year again grew Soya Bean with great success. All the green fodder requirements were grown on the farm. A new introduction was the making of Lucerne meal, which is used largely to supplement the purchased bran formerly fed.

General.—The financial aspect of the farm shows a decrease in income, last year's realizations being Rs. 3,145–10–0 as against Rs. 2,512–6–3 in the year under report ; just what this decrease in income is due to it is hard to say. The farm was once again able to reduce its prices of fowls and setting of eggs to cultivators, the price of a setting of eggs being Rs. 3 as against Rs. 9 the year previous and the price of fowls now being Rs. 4 as against Rs. 8 the year previous. Thus we have been able to give cultivators an opportunity of purchasing really good stock at a very normal figure.

Bombay Gow-Rakshak Mandali.

This institute is progressing very well indeed. The Honorary Joint Secretaries are doing all in their power to make the institute both useful and attractive. They lose no time or opportunity to gather together those taking an interest in cattle to show them the benefits that arise by keeping good pure bred stock in at least one sections of all Gowshalas and Panjrapoles.

The Mandali have erected a Cattle Dip at their Betegaon branch in which their own cattle are dipped; they have generously made this dip available to the public. The tick does unmeasureable harm to cattle and it is hoped by this dipping process to keep the tick population under control.

The Mandali placed out 9 pure Gir breed bulls in the district.

The Mandali continues to do good propaganda in the district for the improvement of cattle. They very generously helped the Cattle Show at Nasik, which was pronounced as a great success by all and sundry. Their Silage Demonstration at Kandivlee and Betegaon attracts attention; similarly the Mandali held a Show at Borivli, meeting all expenses.

The farm (Kandivlee) unfortunately has suffered a good deal of loss from contagious abortion, the control of this has been taken up seriously and it is hoped to eradicate the disease early.

The Mandali are developing their sub-station at Betegaon as quickly as resources will permit. A new stable built on up-to-date lines is nearing completion.

The Honorary Joint Secretaries and the paid staff are to be congratulated on their good work. If all Gowshalas and Panjrapoles did as this institute is doing, in 20 years there would be no cattle problem in the country.

Infants and Public Milk Supply Co. Ltd. (Bombay).

Palghar Dairy Farm.—This Company under the able Directorship of Mr. P. P. Mistri is making great headway, now that Mr. Mistri has freed the Company from debt. The farm is now what a farm should be; everything is clean and tidy. More and more land is being brought under cultivation. The farm has for the fifth year in succession paid a dividend. The Company have volunteered to pay Re. 1 an acre rent for their land as against annas 8 per acre paid up to the present.

Nutritional Problems.

Mr. A. K. B. Cazi held charge of the Nutrition Section from 15th December 1933 onwards, during his absence, Mr. M. M. Desai carried on the work.

Mr. Cazi has been able to collect some very useful information. The Mineral Mixture formulæ which he completed in collaboration with the Agricultural Chemist Rao Bahadur Sahasrabuddhe, has been a great

success. The formulæ has been handed over to the Deccan Agricultural Association, Poona, who now manufacture this on a commercial scale. The Mineral Mixture will, I feel, help considerably the growing of better stock in the Konkan and other heavy rainfall tracts, where the fodder is very poor in essential minerals; due to this deficiency the cattle are poor and make little or no growth.

The details of experiments are separately reported in the Annual Experimental Records for the year 1933–34. The following is the enumeration of the problems tackled during the year:—

Experiments carried out at the different Farms under the Live Stock Expert to Government, Bombay Presidency, Poona, during the year 1933–34

Northcote Cattle Farm, Chharodi—

(1) Commercial Mineral Mixture *vs.* Rock Salt.
(2) Departmental Mineral Mixture *vs.* Rock Salt.
(3) Crushed Oats *vs.* Sprouted grains in feeding of work cattle.
(4) Investigation of feed cost of rearing up "B" class breeding bulls.
(5) Improvement of grazing areas.
(6) In-breeding with Ujol.
(7) Attempts to grow Legumes.
(8) Early *vs.* Late sowing of Jowar.
(9) An observation with Oats fodder to see whether two cuttings can be obtained with advantage from the crop.

Bombay Gow-Rakshak Mandali's Cattle Breeding Farm at Kandivlee—

(10) Experiment to determine the influence of Malt in the ration of young calves on their rate of growth.

All Farms—

(11) Introduction of Soya Bean.

Central Poultry Farm, Kirkee, and Cattle Breeding Farm, Bankapur—

(12) Introduction of Exotic grasses.
(13) Mineral contents of Herbage of Bombay Presidency.

Central Poultry Farm, Kirkee—

(14) Experiment on Chick Nutrition (growth promoting harmone).
(15) Experiments to compare merits of fish meal, locust meal, butter milk powder and Soya bean in Chick Nutrition.
(16) Experiment to compare the feeding value of Dry Hopper meal and Fish meal in the ration of poultry birds from the point of view of egg production.

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX I.

Statement showing Effect of Sires on "Early Maturity" in his Daughters as compared with their Dams.

(From 1925–26 to 1933–34—9 years).

Serial No.	Name of Sire.	Number of cases examined during the last nine years.	Average age at which Daughters have their First Calving.	Average age at which Dams had their First Calving.	Improvement over Dam in Maturity.
			Y. m.	Y. m.	Y. m.
1	Mohan ..	53	4 1¼	5 5	1 3¾
2	Kachari (of 1911) ..	12	4 6½	5 8	1 1½
3	Nawab ..	8	5 4	5 6½	0 2½
4	Sultan ..	8	4 11¼	5 4¼	0 5
5	Chitram ..	26	4 5¼	5 9¼	1 4
6	Moti ..	3	4 10¾	4 11½	0 0¾
7	Vadli ..	3	4 10	4 11½	0 1½
8	Kamudo ..	9	4 1½	5 8¼	1 6¾
9	Senduri ..	6	3 11½	5 5	1 5½
10	Bhim ..	27	3 11¾	5 3	1 3¼
11	Resham ..	3	3 11½	5 1	1 1½
12	Faterio ..	6	4 3¾	5 8½	1 4¾
13	Kevdo ..	2	4 3	4 10	0 7
14	Bhuri ..	2	4 11	5 ¾	0 1¾
15	Bhotu, 2 of 1924 ..	1	4 2	4 1¾	—0 0¼*
16	Todar ..	16	4 3¾	4 11	0 7¼
17	Farsi ..	3	4 2¼	4 0¼	—0 2*
18	Kachari, 8 of 1925 ..	3	3 11½	4 5¾	0 6¼
19	Renchhi ..	7	3 10¾	4 5½	0 6¾

**Note.*—Two bulls, namely Bhotu (2–1924) and Farsi show retrogression instead of progression, but the cases under them are very few.

Appendix II.

Statement showing Progress in Yielding Capacity of Kankrej Herd at the Northcote Cattle Farm, Chharodi, during a period of 10 years.

Serial No.	Year.	Average number of cows during the year.	Number of individual cows in the Cow Herd.	Number of cows milked.	Percentage of cows milked to the total number of cows.	Number of cows yielding 1,500 lbs. and above.	Percentage of 1,500 lbs. cows to the total number of cows.	Annual average yield per cow milked in lbs.	Average yield per annum per cow in the herd.	Remarks.
1	1924–25 ..	204	..	109	53	16	7·8	932 11	..	
2	1925–26 ..	173	..	93	54	32	18·5	1,330 14	..	
3	1926–27 ..	181	..	109	60	28	15·4	1,074 1	..	
4	1927–28 ..	128	..	90	70	33	25·6	1,400 0	..	
5	1928–29 ..	100	..	94	94	31	31·0	1,456 0	..	
6	1929–30 ..	88	..	74	84	41	46·6	2,044 8	..	
7	1930–31 ..	78	..	66	85	43	55·1	1,879 8	..	
8	1931–32 ..	75	..	64	85	42	56·0	2,179 10	..	
9	1932–33 ..	..	83	78	94	40	48·0	2,152 9	1,952 6	(1).
10	1933–34 ..	..	83	80	96	39	47·0	1,809 12	1,804 11	(2).

Note.—(1) The new figure of "Annual Average Yield per Cow in the Herd" for 1932–33 is shown for comparison with that of this year (1933–34).

(2) The new figure of "Annual Average Yield per Cow in the Herd", viz., 1804–11 is very nearly the same as the old figure viz., 1809–12, i.e., a difference of 5 lbs. This is very significant in showing that the dry period for cows is very small, and that there are very few cows that may be classed as useless.

Appendix III.

Comparative Statement of Calving and Average Milk Yield per cow (Chharodi Farm).

Month.	1931–32		1932–33		1933–34		Remarks.
	Number of Calving.	Average monthly yield per cow.	Number of Calving.	Average monthly yield per cow.	Number of Calving.	Average monthly yield per cow.	
		Lbs.		Lbs.		Lbs.	The year 1933–34 had several disadvantages as compared to previous years :—
April ..	11	308	4	279·9	7	267·6	
May ..	9	303	12	257·9	3	264·7	(*i*) Incessant rain during August prevented the high level mark in yield of milk during August and September, when F. & M. also prevailed.
June ..	7	282	7	246·3	5	274·5	
July ..	4	310	6	303·4	..	314·3	(*ii*) The year began with 4 very bad cases of F. & M. and during the monsoon 3 very good milkers were sent to the Panjrapole being cases of contagious abortion.
August ..	1	384	3	342·2	2	327·9	
September .	..	333	1	310·5	2	270·0	
October ..	..	341	..	293·5	3	305·9	(*iii*) Only 13 heifers calved for the first time as compared to 19 in 1932–33 and 17 in 1931–32 : and of these 13, 6 calved in the latter, part of the year i.e. during 1934.
November .	1	302	3	260·7	5	285·9	
December .	5	321	7	278·0	3	298·8	
January ..	8	339	5	260·4	14	260·4	(*iv*) The cold spell (frost) during January and February caused lower yields.
February ..	7	292	9	243·2	11·	224·8	
March ..	7	292	13	298·8	5	267·8	Yet the yield has remained on a fair level except during September and February.

Appendix IV.

Statement showing the minimum age of Heifers of 1st covering during the year—1933-34 *at the Cattle Breeding Farm, Bankapur.*

Serial No.	Name of Heifer.	Brand No.	Date of Birth.	Date of Covering.	Age at the time of covering.
					Y. m.
1	Jangali Beti V ..	225	17th November 1930.	17th August 1933 ...	2 9
2	Shatigal I Betika IB Beti II	229	12th January 1931 ..	22nd December 1933	2 11
3	Putali II Betika I Betika Beti I.	238	13th March 1931 ..	10th January 1934 ...	2 10
4	Jangali Beti VI ..	249	15th December 1931.	25th February 1934.	2 2
5	Athavis I Betika Beti IV ..	245	20th September 1931.	5th March 1934 ...	2 6
6	Karapadagedi III Betika Beti II.	244	26th August 1931 ...	6th March 1934 ...	2 7
7	Handi I Betika Beti II ..	254	1st February 1932 ..	6th March 1934 ...	2 1
8	Laxmi II Betika I Betika B. II,	247	13th November 1931.	23rd March 1934 ..	2 4
9	Jangali II Betika Beti II ..	262	2nd January 1932 ..	13th April 1934 ...	2 3
10	Gyara II Betika Beti V ...	253	27th January 1932 ..	19th June 1934 ...	2 5
11	Jangali I Betika Beti V ...	243	26th August 1931 ..	26th June 1934 ..	2 10

Statement showing average yield of Eggs of different

Breed and Strain.	Average No. of Birds laying per month.	Yield per					
		April 1933	May 1933	June 1933	July 1933	August 1933	Septem-ber 1933
Wyandottes ..	13·6	184	196	207	216	181	144
Rhode Island Reds ..	23·9	370	348	299	241	154	125
Australorps ..	4·4	36	83	76	26	30	45
White Leghorn (Prince of Wales).	9·6	253	289	351	194	99	63
White Leghorn (Goodwin Preece).	20·1	426	442	463	580	476	381

V.

breeds at the Central Poultry Farm, Kirkee.

month.						Average yield per bird.	Average yield per bird per annum.
October 1933	November 1933	December 1933	January 1934	February 1934	March 1934		
133	174	180	224	202	200	13·73	165
197	188	253	399	326	305	11·07	133
73	71	65	71	81	59	13·02	156
33	42	99	144	71	89	14·75	177
253	331	353	413	355	339	19·95	239

Appendix VI.

Statement showing the Incubation Results at the Central Poultry Farm, Kirkee.

Serial No.	Month.	Kind of Incubator.	Total charge.	Percentage of Infertiles.	Percentage of Hatch of the total charge.	Percentage of Hatch of the Fertiles.	Remarks.
1	December 1933.	Hearson's (Big and Small), Phipps and Silver Hen.	271	42·5	15·8	57·5	*N.B.*—Percentage of Dead in shell excluding infertiles : 72·4.
2	January 1934 ..	Hearson's (Big and Small), Phipps and Iron Clad and Buckeye.	366	33·3	44·8	60·3	*N.B.*—Percentage of Dead in shell : 32·7.
3	February 1934.	Hearson's (Big and Small), Phipps and Iron Clad and Buckeye.	400	20·5	67·5	79·5	*N.B.*—Per centage of Dead in shell : 15·09.
4	March 1934 ..	Hearson's (Big and Small), Phipps and Iron Clad and Buckeye.	200	23·5	56·5	76·5	*N.B.*—Per centage of Dead in shell : 26·2.

Appendix VII.

Statement showing stock of birds, chicks and setting eggs supplied to Government Stations and Out-Stations from the Central Poultry Farm, Kirkee.

Government Station.	Stock supplied.		Out-Station.	Stock supplied.	
	Number of setting eggs.	Number of birds and chicks.		Number of setting eggs.	Number of birds and chicks.
Agricultural Experimental Station, Dharwar.	..	14	Poona ..	30	107
Agricultural Overseer, Malegaon ..	..	4	Bombay ..	..	29
Agricultural Overseer, Dharwar ..	..	1	Belgaum ..	..	2
Agricultural Overseer, Palghar ..	..	21	Bangalore ..	..	13
Agricultural Assistant, Sansar, Nagpur (C. P.)	7	..	Beawar (Rajputana).	..	2
			Ahmedabad ..	15	..
Superintendent, Visapur Prison ..	..	12	Uran (Kolaba ..	120	2
District Local Board, Satara ..	..	75	Goa ..	..	3
Village Improvement Committee, Sholapur.	..	9	Satara ..	75	..
Taluka Development Association, Yeola.	..	8	Ahmednagar ..	15	2
Taluka Development Association, Raver.	..	4	Sholapur ..	..	2
Taluka Development Association, Dahanu.	..	2	Khandesh ..	..	3
			Thana ..	..	13
Taluka Development Association, Gokak	..	2			
Agricultural Association, Ajara ..	..	1			
Taluka Development Association, Malegaon.	..	6			
Taluka Development Association, Jalgaon.	30	..			
American Mission, Ratnagiri ..	..	4			
	37	163		255	178

Appendix VIII.

Statement showing the strength of flock during the year 1933–34.

(Central Poultry Farm, Kirkee.)

Serial No.	Breed (adults).	Sex		Total.	Breed (under year).	Sex.		Total.	Serial No.	Chickens.	Total.	Grand total of flock.	Remarks.
		Cocks.	Hens.			Cockerels.	Pullets.						
1	White Leghorn ..	4	29	33	White Leghorn ..	..	..	..	1	White Leghorn ..	220		
2	Australorp	3	7	10	Australorp ..	..	..	..	2	Australorp ..	61		
3	Rhode Island Red ..	4	22	26	Rhode Island Red ..	..	..	..	3	Rhode Island Red ..	140	550	
4	Wyandotte	2	17	19	Wyandotte ..	1	..	1	4	Wyandotte ..	40		
	Total ..	13	75	88		1	..	1			461		

APPENDIX IX.

Statement showing month by month the disposal of stock at the Central Poultry Farm, Kirkee.

Month.	Number of eggs hatched.	Died and destroyed.		Sold.		Purchased.	Sold.		Remarks.
		Adults.	Chicks.	Adults.	Chicks.		Table eggs.	Setting eggs.	
	No.	No.	No.	No.	No.	No.	No.	No.	
April 1933 ..	..	..	..	12	18	..	294	..	
May 1933 ..	..	..	..	3	..	..	1,245	..	
June 1933 ..	..	..	..	..	..	..	1,413	..	
July 1933 ..	..	..	..	..	..	..	1,404	..	
August 1933 ..	..	..	..	61	20	..	1,266	..	
September 1933 ..	..	..	..	64	17	..	927		
October 1933 ..	..	17	65	15	..	..	756	..	
November 1933 ..	..	..	..	31	..	13	644	15	13 birds were imported from England.
December 1933 ..	..	..	..	30	41	..	565	75	
January 1934 ..	..	..	..	16	..	..	729	45	
February 1934 ..	590	..	..	5	..	..	679	75	
March 1934 ..	..	..	..	6	5	..	552	82	
Total ..	590	17	65	240	101	13	10,474	292	

APPENDIX X.

Statement showing the number of Stud Cocks put out in the District during the year 1933-34.

(Central Poultry Farm, Kirkee.)

Serial No.	Name of Division.	Number of Stud Birds put out in 1932-33.	Number of Stud Birds put out in 1933-34.
1	Northern Division (including Bombay and Suburbs) ..	2	18
2	North Central Division	8	7
3	South Central Division	62	85
4	Southern Division	3	8
5	Native States	20	2
	Total ..	95	120

Programme of Work under the Live-stock Expert to Government, Bombay Presidency, Poona, for the Year 1934–35.

I. *Breeding Farms.*—The policy of breeding up reliable pure strain of cattle will continue, keeping in mind the production of a more economical animal, which will mature early and calve more regularly. The breeding of a good dual and draught purpose animal on the above lines will continue at Chharodi and Bankapur respectively.

II. (*a*) Investigations and experiments will be conducted on the various food-stuffs as far as finances will permit.

(*b*) The cost of raising "B" class bulls purchased in "A" Zone will continue.

III. (*a*) Propaganda in connection with the spreading of the use and benefits of pedigree bulls will continue together with teaching of better methods of care.

(*b*) The Herd Register introduced two years before will continue, the idea being to number in one ear and the initials of the village in the other of all the pure cattle of each breed. Thus in a few years we shall have all the pure types of cattle pedigreed, as we shall know the dams and sires. Moreover, we shall be able to trace progeny of Premium bulls. This method will be advantageous to breeders, as they can with the Certificate supplied prove their animals to be well bred.

IV. The co-operation with the Kandivlee Gowrakshak Mandali will continue in breeding, raising and spreading in towns the Gir breed, which is very useful for this purpose, together with the fine illustration of what can be done if the people are so inclined with Pinjrapoles to make them useful institutions to the country instead of the burden they are at present.

V. The laying out of permanent irrigated pastures at Betegaon and to work out the economic value of the same.

VI. The co-operation with the Sangli Industrial and Agricultural School, Sangli, in improving goats on a small scale will continue.

VII. Experiments in growing fodder crops on farms will continue.

VIII. *Poultry.*—(*a*) The work of breeding suitable foreign breeds of poultry will continue on the Government Central Poultry Farm, Kirkee.

(*b*) Investigations regarding incubation, control of diseases and feeding of poultry.

(*c*) To help and advise poultry breeders as far as it is possible.

(*d*) Experiments in the egg laying capacity of different breeds in single testing pens will continue.

IX. *Sheep.*—It is hoped that the Sheep Breeding Scheme will be financed in the coming year and that this very urgent work will be taken in hand.

X. *Poultry and Goats.*—Should finances be allotted for the new Schemes submitted, this work will also be started.

XI. *Buffaloes.*—If finances permit, it is hoped to take in hand the improvement of the buffalo in the Chharotar tract of Gujerat.

XII. *Palghar Dairy District Scheme.*—It is hoped that during the year we shall be able to start this Scheme. If we can get just one person to start, it is hoped that many will follow.

XIII. *Nutritional Problems.*—Owing to a number of difficulties, the chief being finance and proper housing arrangements for experimental animals, it has been decided to concentrate the work and attention to a fewer experiments. Consequently the following experiments of urgent economic importance are proposed to be undertaken :—

At Northcote Cattle Farm, Chharodi.

(1) Departmental Mineral Mixture *versus* Rock Salt *versus* No Salt.

(2) Further observation on Soya Bean cultivation.

At Cattle Breeding Farm, Bankapur.

(3) Departmental Mineral Mixture *versus* Rock Salt *versus* No Salt.

(4) Further observations on introduced grasses.

(5) Further observation on Soya Bean cultivation.

At Government Central Poultry Farm, Kirkee.

(6) Comparative merits of different food-stuffs on poultry birds.

(7) Further observation on Soya Bean cultivation.

(8) Further observation on exotic grass.

At Bombay Gow-Rakshak Mandali's Cattle Breeding Farm, Kandivlee.

(9) Comparative merits of fodder grasses in co-operation with the Economic Botanist to Government, Bombay Presidency, Poona.

In the districts of the Konkan.

(10) Testing the value of the Departmental mineral mixture.

APPENDIX M.

Summary of Work done under the Agricultural Engineer to Government, Bombay Presidency, Poona, for the Year 1933-34.

During the year under report Mr. C. G. Paranjpe continued to hold charge of the Agricultural Engineering Section of the Department partly in the capacity of Assistant Agricultural Engineer and partly as Agricultural Engineer to Government. The post of the Agricultural Engineer to Government, which was kept in abeyance due to retrenchment, has been revived from 14th November 1933 and that of the Assistant is abolished.

There has been no change in the establishment with the exception of an additional store clerk, whose services were badly needed since long. The section was all along very busy with the several works entrusted to it in connection with two more important schemes sanctioned by the Imperial Council of Agricultural Research for this Presidency. The progress in the sale of boring machines and also in the hiring out of boring machines and pumping plants has been fairly encouraging, irrespective of the present depression.

The activities of the Department can be summarised as under:—

Advice and Help.

The number of inquiries for advice amounted to 63, out of which 16 are for pumping, 7 for tractor ploughing, 8 for boring, 11 for hiring out of pumping plants, 2 for oil mills, 13 for oil engine class and 6 for miscellaneous subjects. Much attention and time could not be given to inspection of sites for pumping plants, owing to other important works and consequently only 3 pumping sites could be inspected. The number of drawings and estimates amounts to 82 and 32 respectively, out of which 78 and 30 respectively pertain to Schemes of Imperial Council of Agricultural Research only as detailed below:—

Name of Scheme.	Drawings.	Estimates.
Dry Farming Research Scheme ..	64	28
Cold Storage Scheme	8	..
Sugarcane Research Scheme ..	6	2

Works in connection with the Schemes of Imperial Council of Agricultural Research.

Padegaon.

The work of laying about 1,400 feet of 6″ Hume piping with 30 R. C. C. Sinks with necessary outlets and flap valves for the 3rd year water measurement experiments at Padegaon, which was left over for want of time and funds, has been completed this year.

Cold Storage Plant.

The Department had the advantage of installing a Cold Storage Plant at the Ganeshkhind Fruit Experiment Station, Kirkee, in connection

with the Cold Storage Scheme, sanctioned by the Imperial Agricultural Research Council, Delhi. The plant consists of 7 insulated cold rooms, a duplicate refrigerating set and a duplicate set of Brine Pumps for cooling purposes. It is driven by electricity and is fitted with the most up-to-date and automatic electric controls such as Thermostats, electric valves, etc., for an efficient running. The condenser of the refrigerating set is kept cool by the two elevated tanks fixed on a suitable steel tower and they are kept full by an electrically driven centrifugal pump from a small masonry tank fed by the Lotus tank. The total expenditure on the whole installation amounts to Rs. 38,875 approximately.

Dry Farming Research Scheme.

In connection with the Dry Farming Research Scheme, this Department is entrusted with all the constructions at the two experimental stations, viz., Sholapur and Bijapur, like the Sugarcane Research Scheme for Deccan, at Padegaon, consisting of the following :—

SHOLAPUR.

(1) Steel wire-fencing about one and a half miles in length with gates, etc.

(2) Laboratory, Office, Superintendent's quarters, Graduate and Non-Graduate quarters and Coolie lines.

(3) Store and implement shed, Bullock shed, Gas plant house, Engine shed, Pot-culture House.

(4) Water supply including sinking of a well and fixing a pumping plant on it with about 2,000 feet pipes with necessary fittings and connections and distributing the water from the reservoir to the various centres.

BIJAPUR.

(1) Steel wire-fencing about 1½ miles in length with gates, etc.

(2) Office and Laboratory, Superintendent's quarters, Coolie lines and Non-Graduate quarters.

(3) Store and implements shed and Bullock shed.

(4) Water supply including sinking of a 3″ borehole 65′ deep, fixing a bore-hole pump on it, carrying the water to a storage tank about 800′ away and distributing same to the various centres.

With the exception of the Pot-culture House at Sholapur, all the works have been completed. The work of the Pot-culture House is in hand and it is expected to be completed before the middle of August next.

It may be noted here that all the steel works pertaining to the above three works including sheds, towers, fencing, etc., etc., were constructed departmentally. The estimated total cost of the above constructions amounts to Rs. 20,000 approximately.

Research on Implements.

The work on design or modifications of implements used to always suffer for want of time owing to other important activities but this year a special effort was made not to allow this work to suffer much. The result is that we have been able to attend to the following :—

Seed Drill.
Winnowing Fans.
Groundnut Raiser.
Lemon Juice Extractor.
Tyne Cultivator.
Dust Gun.
Wheat Thresher.
Soil Scooper.

A brief summary of the work done on each of the above is given below in the order they stand.

Seed Drill.—The new drill was given exhaustive trials at Dharwar and in the neighbourhood on cotton and jowar on a comparatively large scale and about 70 acres were sown with it. It was noticed that it can work even in wet soil, of course with increased draft, because the weight of the drill is taken up by the wheels and consequently they do not slip in wet soil. Another machine was also tried at Mohol Farm in *rabi* season and at Koran Farm on bajri and *rabi* jowar.

The figures of draft taken during these tests corroborate the figures taken in the previous year and as they are between 100 to 130 lbs. against 70 to 100 lbs. with the country drill, it can be safely said that the question of draft is satisfactorily solved. The last " Cresco " meeting has accepted this statement but suggested to devise a more efficient scraping arrangement which will enable the drill to work in the drizzling of rain and efforts in that connection are in progress.

Winnowing Fans.—The Crop Research Committee last year had suggested to devise a machine to raise just sufficient wind for winnowing purposes as they considered the improved winnower to be rather costly. Efforts were, therefore, made to design the following machines for further experiments.

(1) A rope gear fan of 24" diameter.

(2) A chain gear fan of 24" diameter.

(3) A tooth gear fan of 24" diameter.

(4) A horizontal blower.

It will be possible to give the relative value of each of the above on conducting their trials in the next threshing season.

Groundnut Raiser.—The rotary groundnut raiser built at the shops was given a further trial in Gadag Taluka of Dharwar District. The results which are given below are found to be fairly encouraging and it has been now decided to run a comparative test with different types

of raisers, including the Gujrath and the United Province raiser, and ascertain their relative position.

Serial No.	Name of Soil.	Rotary Raiser				Country Harrow.			
		Draft per square inch in lbs.	Hours of work	Land dealt with	Work in a day of 8 hours	Draft per square inch in lbs.	Hours of work	Land dealt with	Work in a day of 8 hours
1	2	3	4	5	6	7	8	9	10
		Lbs.	H. m.	A. g.	A. g.	Lbs.	H. m.	A. g.	A. g.
1	Sandy soil ..	2¼	1 30	0 17·5	2 13	3¼	1 30	0 12	1 34
2	Loamy soil ..	2½ to 6	2 30	0 30	2 16	4 to 8	2 0	0 14	1 16
3	Stony soil ..	2¾ to 4	3 0	0 27	1 32	4½ to 14	2 0	0 13	1 12
	Average ..	2½ to 3	..	..	2 7	4 to 7	..	..	1 17

Lemon Juice Extractor.—The single press type machine was tried at the shops on a comparatively large scale and then it was sent to Mr. Manekchand Kisandas of Utran, in Khandesh, for exhaustive trials. He found the machine most useful and has, therefore, got from Jalgaon some more machines made to it for his constant use. The machine presses 150 lemons per hour and gives an extraction of about 54 per cent.

Tyne Cultivator.—A 5-tyne cultivator has been made at the shops for work in Gujrath in accordance to the requirements of the Deputy Director of Agriculture, Gujrath, Surat. The machine is yet to be tested and consequently the results cannot be given this year.

Dust Gun.—An attempt was made to build a dust gun on the "Peerless" dust gun model within the price of a new machine and although it proved a success, it was found that it is not economical to build a few machines of this type especially when the weight, the finish and the appearance ought to be entirely identical. The methods, the manufacturers adopt in the making of these machines, which involve electric welding, stamping, pressing, etc., are very expensive and not worth the consideration when building one or two machines only. It has, therefore, been decided not to persue this problem any further.

Wheat Thresher.—In connection with conducting comparative tests with different methods of threshing including the ideas, which were in view from the experience gained in similar trials in Gujrath last year, three machines were built at the shops and sent to Arnej in Dholka Taluka for trial.

The methods tried were as under :—

(1) Trodding of the stuff by bullocks.

(2) Working a cart over it.

(3) Using a Norag thresher.

(4) Using an Olphad thresher.

(5) Using a Cawnpore thresher.

(6) Using a Jenkin's thresher.

(7) Using a combination of Olphad and Norag threshers built at the shops.

(8) Using a combination of Olphad and Norag threshers with slight change in teeth and spacing block.

(9) Using a taper roller with horizontal blades made at the shops.

The results of the trials which are given below show that the machines Nos. 7 and 8 built at the shops gave the best results from all points of view particularly in output, draft, cost and ease of working.

——	1	2	3	4	5	6	7	8	9
Output per day of 9 hours in lbs.	6,417	3,529	4,974	4,000	4,119	8,112	7,648	6,497	This did not work properly.
Draft in Cwts.	..	1 to 1¼ Cwt.	1—2	½—1	¾—1½	1—2½	¾—1½	¾—1½	
Cost ..	..	..	55	35	45	65	50	50	

Soil Scooper.—A soil scooper has been designed and built at the Shops for the Chief Investigator, Dry Farming Research Scheme, Sholapur, for checking the run off and at the same time conserving moisture. The machine is being given exhaustive tests and it will be possible to say something about its performance next year.

Miscellaneous Works including Repairs.

The following is a list of miscellaneous works, including repairs executed at the shops and outside during the year under report for the different departmental institutions :—

(1) Manufacture of a steel trolley for the new chaff cutting plant in Khandesh.

(2) Repairs to Myers pump at Niphad and Karjat Farms.

(3) Repairs to Lawn Mower from Dharwar Farm.

(4) Repairs to Sterilizer, Sprayer and Dusting machine from the Plant Pathologist to Government, Poona.

(5) Repairs to Hot Air engine and Air pump from the Agricultural Chemist to Government.

(6) Manufacture of a Brooder for the Poultry Farm.

(7) Repairs to tractor at Jalgaon Farm.

(8) Fencing at the Cereal Breeding Station, Niphad.

(9) Fencing at Nadiad and Karajgi.

(10) Repairs to the Blackstone engine at the Ganeshkhind Fruit Experiment Station, Kirkee.

(11) Temporary erection of a pumping plant at Bankapur Farm.

Hire of Plants and Sale of Tools and Machines.

The new model L. Case Tractor was given on hire to Messrs. M. L. Dahanukar & Co., Ltd., for ploughing their lands at Belvandi and Belapur. The machine worked for 184 days (1,597 hours and 20 minutes in the season and ploughed 831 acres of land with an average of 4·5 acres per working day. The bill of hire which is preferred lately will appear as receipt in the next year's report.

Eleven people took benefit of the pumping plants kept with the Department for hiring purposes, partly for emptying wells and partly for irrigation.

One F-3 Calyx Drill was given on hire in Dharwar District for boring purposes which has completed 6 bores with an aggregate footage of 543 feet. Out of the 6 bores, 3 are successful and 3 are failures.

One F-3 drill was given on hire to a gentleman at Panchgani and although it bored 100′ no water was tapped.

One hand machine was also loaned to gentleman in Poona and the bore was successful.

The total departmental receipts for the year under report amount to Rs. 14,370–9–4, as detailed below :—

Rs.	a.	p.	
8,964	6	0	Sale of boring machines.
2,570	7	5	Sale of stores and other machines.
1,122	12	10	Hire of boring machine.
1,696	7	1	Hire of Pumping Plants.
16	8	0	Miscellaneous.
14,370	9	4	

The staff has done fairly well in the discharge of their duties.

C. G. PARANJPE,

Agricultural Engineer to Government,
Bombay Presidency, Poona.

Programme of Work under the Agricultural Engineer to Government, Bombay Presidency, Poona, for the year 1934-35.

(1) Research on implements including modifications and tests.	(*a*) Modifications and tests with new seed drill, the Groundnut Raiser, the tyne cultivator, the Clod Crusher and the new Thresher.
	(*b*) Design and manufacture of a Soil Scooper.
	(*c*) Experiments with water-lifts and other agricultural machinery.
(2) Famine pumping ..	Inspection of pumping sites on large rivers in the Presidency for growing fodder.
(3) Advice and practical help..	(*a*) Training of cultivator students in engine-driving.
	(*b*) Periodical inspection of agricultural machines.
	(*c*) Advice to cultivators in agricultural machinery.
	(*d*) Advice to Divisional Officers in machinery.
	(*e*) Estimates, drawings, designs and surveys.
(4) Higher technical assistance.	(*a*) Resource to Divisional Officers in case of repairs and breakdowns.
	(*b*) Erection of big plants, sheds and and structures.
(5) Special works ..	(*a*) Remaining construction in connection with the Dry Farming Scheme.
	(*b*) Constructions in connection with any scheme sanctioned by the Imperial Research Council.
(6) Running of Plants like the	(*a*) Workshop and Experimental Well.
	(*b*) Motor tractors for private individuals if hired out.
(7) Sale and hire of machines..	(*a*) Sale of boring machines and tools.
	(*b*) Hire of boring machines.
	(*c*) Hire of pumping plants.
	(*d*) Sale of other machines.
	(*e*) Sale of the Nangaon Pumping Plant.

(8) General	..	(*a*) Routine work pertaining to office, workshops, experimental well and divisions.
		(*b*) Charge and maintenance of Nangaon plant and the boring machines until they are sold, the Karajgi power baling plant, the famine sets and the steam plough.

C. G. PARANJPE,

Agricultural Engineer to Government,
Bombay Presidency, Poona.

APPENDIX N.

Summary of work done under the Horticulturist to Government, Bombay Presidency, Poona, for the year 1933-1934.

Staff.—During the year under report, Mr. V. H. Kulkarni, M.Ag., Superintendent, Modibag, was transferred to Ratnagiri as Superintendent, Shirgaon Farm, under the Deputy Director of Agriculture, S. C. D., Poona, and Mr. S. S. Bhat, M.Ag., is appointed in his place. Mr. S. K. Patwardhan, B.Ag., Superintendent, Shirgaon Farm, is transferred to work under the Horticulturist to Government, Bombay Presidency, Poona.

Laboratory work.—Experiments on fruit preservation in the Horticultural Laboratory have been closed down for want of adequate equipment to carry out research. Teaching of Optional B.Ag. students in this subject is carried on with whatever facilities are available at present.

Horticultural teaching.—There were thirteen Optional Horticultural students during 1933-34 for the final B.Ag. course, out of whom all have passed the degree examination successfully. The practical horticultural class at the Ganeshkhind Fruit Experiment Station, Kirkee, had six students. Horticultural teaching continues to be popular as in previous years.

Publications.—During the year under report, the following papers have been published :—

1. " A study of the Citrus varieties of the Bombay Presidency, " by G. S. Cheema and S. S. Bhat. " Current Science ", February, 1934.
2. " Fruit Research in India, its importance, history and scope, " by G. S. Cheema. " Current Science ", April 1934.
3. " The leaf, flower and fruit characters of the Santra orange, " by S. S. Bhat. " Current Science ", June 1934.

Marketing studies.—The Horticulturist to Government has worked as a member and a reporting officer of the Bombay Fruit and Vegetable Market Committee, appointed by the Government of Bombay by Government Resolution, Revenue Department, No. 8784/20 of 28th June 1933. This Committee has nearly completed its investigations, and it is expected that its report will be submitted to Government soon.

The Horticulturist to Government submitted a detailed statement in regard to the railway freight concessions, which are needed in order to improve transport of fruit, and to promote the development of fruit industry in the Presidency.

The question of the control of quality and quantity of fruit for export is now in hand and a statement on the subject will be submitted soon in case the marketing section does not take over this work.

Registration of nurserymen.—A regular proposal is now drafted for the voluntary registration of nurserymen. If this proposal is accepted, it will help nurserymen to extend their business on sound lines, and the growers can get genuine and high quality stock for planting. Several nurserymen have already agreed to the principle of registration.

The Ganeshkhind Fruit Experiment Station, Kirkee.

(*Formerly the Ganeshkhind Botanical Garden, Kirkee.*)

The Government of Bombay have approved the change in the nomenclature of the Ganeshkhind Botanical Garden, Kirkee, which will henceforward be called, "The Ganeshkhind Fruit Experiment Station, Kirkee".

Mango manurial trial.—A scheme to find out the best manures for mango trees was prepared and the outlines have met with the approval of the annual Crop Research Committee. Stock plants for this work are being raised, and a plot has been set aside for them. Trials will be laid out in the Latin Square system.

Banana variety trials.—A scheme to test the yield of Basrai variety with that of Walha, has been prepared and the layout is in hand.

Banana manurial trial.—A scheme for this trial also has been prepared on the same lines as for the mango manurial trial, and the layout is in hand.

Guava, pomegranate and grape vines.—Observations as to the value of selected strains of these fruits are being recorded. The grape vine area has been extended. Side by side with Bhokari and Kandhari, the other varieties are also planted.

Vegetable Research.—Improvement of chillies and brinjals by selection is continued. The season was on the whole favourable. It was possible to check the leaf curl disease by timely planting and regular spraying.

(*a*) *Chillies.*—During the year under report, 61 cultures were studied, representing the following varieties :—

(i) Long thin skinned Deccan variety.

(ii) Udkai variety from Belgaum.

(iii) Khadikai variety from Dharwar.

(iv) Dabkai variety from Dharwar.

(v) Thick-skinned varieties.

(vi) Bhopali variety.

Selection has been made for all the important characters. The cultures selected for further study will be tested for purity for a season more. It is now proposed to reduce the number of cultures and undertake intensive studies.

(*b*) *Brinjals.*—The brinjal crop was also a success. During the year, 67 cultures were studied, but selection was restricted to the following important groups :—

(1) Foreign types having purple conical fruit.

(2) Long purple type.

(3) Round purple type.

(4) *Gote* wangi of the Deccan.

(5) *Dorli* wangi of the Deccan.

(6) Krishna valley type.

(7) Long green.

As in the case of chillies, the number of cultures will be reduced and study will be directed to their purity for morphological characters before testing for yield. Certain intensive studies will also be undertaken.

MODIBAG, AGRICULTURAL COLLEGE, POONA.

As previously reported, the experimental work of this garden is stopped. Observations on alternate bearing of mangoes, citrus and mango stock studies, mango budding etc. are being wound up.

Mango stocks.—Most of the seedling stocks have borne fruit this year. There is a wide range of variation in the size, shape, colour of skin and pulp, taste, and stringiness of fruits borne by seedlings raised from seeds of the same tree. This experiment which has lasted for over ten years, has yielded substantial proof of the cause of variation of seedling varieties, as well as to the origin of large number of mango varieties existing now. These seedlings will be top-grafted with scions of alphonso to see the influence of stock on scion.

One of these seedlings has borne fruit of first quality with medium size, attractive colour, and hard non-stringy pulp of excellent flavour.

Grape vine.—Seedlings are yet under observation. The final selections are not yet made.

New introductions.—The grape fruit trees have come to bearing and the first fruit harvested was slightly dry with thick rind. The trees are in very good health.

The demand for navel oranges and Italian lemons is increasing.

All these plants are now available with private nurserymen, through whom distribution is being done for trial purposes in different parts of the Presidency, in order to find the most suitable tract for their cultivation.

Nursery.—The Modibag has now an attractive citrus nursery. Mango grafts and other fruit plants are also raised on a large scale. This is expected to be one of the most paying activities of the garden.

Advisory Work.

During the year under report, one horticultural class was held at Erandol, and three shows and demonstrations were organised. In reply to enquiries from the public, advices were given on horticultural matters.

As a result of horticultural propaganda, fruit plantations have increased considerably in the Presidency during the year 1933-34 for which acreage figures are not available as yet.

Short Summary of Papers and Books published by the Members of the Horticultural Section.

(1) *Cheema, G. S., and Bhat, S. S.*—

"A study of the citrus varieties of the Bombay Presidency," Current Science, February 1934.

The citrus fruits form an important group of the fruits grown in the Bombay Presidency. But, the current botanical names of the various varieties found, are not in accordance with those of similar fruits in other countries. The paper therefore discusses the various schemes of citrus classification offered till now by different authorities, and fits the Bombay varieties into Swingle's scheme and assigns new names to them accordingly.

(2) *Cheema, G. S.*—

"Fruit Research in India, its importance, history and scope," Current Science, April 1934.

This paper briefly describes the investigational work on fruits carried out up-to-date in different Provinces of India and emphasises the necessity of progress in this line. It lays down a regular scheme of work for future, dividing different aspects of the problem into Central and Provincial groups.

(3) *Bhat, S. S.*—

"The leaf, flower, and fruit characters of the Santra orange," Current Science, June 1934.

The Santra orange tree is fully described for the leaf, flower and fruit characters. The Santra leaves have shown on analysis that this tree has a special liking to calcium salts as it takes in about 7 per cent. of them in soils containing only 0·3 per cent. of $CaCo_3$, but a limit to this absorption is reached when only 8 per cent. $CaCo_3$ is taken up even in highly calcium-rich (15 per cent.) soils.

Programme of Work for the Year 1934-35.

1. *Marketing studies*—Improvement of marketing system.
2. *Manurial trials*—On mangoes and bananas.
3. *Variety trials*—Of bananas.
4. *Improved strains*—Testing strains of guava, pomegranate, grape and figs.
5. *Introduction of new fruits*—Grape fruit, Italian lemon, Navel orange, etc.
6. *Nurseries*—Voluntary registration of nurserymen, standardization of stock plants, etc.
7. *Vegetable research*—Selection of brinjal and chilli.

APPENDIX O.

Summary of Work done under the Inspector of Agricultural Schools, Bombay Presidency, Manjri Farm, for the Year 1933-34.

Charge.—I held charge of the office of the Inspector of Agricultural Schools, Bombay Presidency, throughout the year. I toured for 192 days during the year under report to carry out my work, according to the programme, attached to the report of the last year.

Staff.—There is no change in the staff.

Head-Quarters.—My head-quarters are still at Manjri Farm.

Lines of Work.—The sphere of my work continued to be the same as it was mentioned in the report of the last year. Though the work of the Inspector of Agricultural Schools, Bombay Presidency, is mainly advisory, it is part of his duty to make agricultural education, as widespread, popular and useful as possible. In some respects, the Inspector is an itinerant teacher, and has to give model lessons in different subjects for the guidance of teachers of both the Vernacular Agricultural Schools as well as those of the Agricultural Bias Classes in the presidency proper.

On account of the financial stringency, the inspection work is curtailed to some extent. The Agricultural Bias Classes managed by different mission societies and other private agencies were not inspected by me during the year under report.

The examination work is just the same as mentioned last year. The examination of the Vernacular Agricultural Schools was conducted by me. The boys of the Government Rural Training School, Loni, were also examined by me in agriculture both theoretical and practical.

Curriculum.—The curriculum of the Vernacular Agricultural Schools was changed in consultation with the Head Masters of both the Vernacular Agricultural Schools. The revised syllabus will be brought into force from next year. The 3 Rs (Reading, Writing and Arithmetic), Sanitation, Civics and Geography are now omitted. Only Agriculture, Botany and Co-operation are retained. Thus the class hours are reduced. More attention will be paid consequently to the practical side of agriculture and to such by-industries as carpentry, smithy, weaving and rope-making. After finishing the prescribed portion in by-industries, it will be possible to concentrate the attention of boys on any one of the by-industries from the economic and business point of view.

The S. M. K. Agricultural School at Devihosur.—During the year under report the school suffered a great loss in the premature and sad death of

Mr. M. M. Kundgol, who was undoubtedly a sincere, painstaking and popular teacher. The school has just begun its 20th year of existence and continues to serve a very useful purpose, being the only Agricultural Vocational School in the whole of Karnatak. The outbreak of Influenza and Plague at Devihosur came in the way of regular training. However, Mr. Chaugule, the Head Master, held classes for a month or so on Dharwar Farm, when there was plague at Devihosur. This school has become considerably popular throughout Karnatak. Though the boys were found to be weak in the field practical, their work in by-industries was quite satisfactory. The samples of the boys' work in carpentry, smithy, weaving and rope-making were sent to the District Agricultural Show at Chikodi and to the Taluka Agricultural Exhibition at Hirekerur and were much appreciated by people in both the places. The weaving demonstration at Chikodi and the Magic Lantern lectures at Hirekerur were most attractive and appealing to the spectators. Many prizes and certificates were awarded to the boys for their work. During the year under report 85 applications were received, out of which 20 students were selected for the 1st year class of the next year. Out of these 20 boys, two have been selected without scholarships. The progress of the school during the year under report was satisfactory. The total expenditure and receipts of the school during the year under report were Rs. 8,131 and Rs. 1,247 respectively. Thus the total expenditure per boy per month comes to about Rs. 26.

Vernacular Agricultural School at Dhulia.—This is the 11th year of the Vernacular Agricultural School at Dhulia, which is the only agricultural vocational school now in the whole of Maharastra. The progress of the school during the year under report was very good indeed. The boys of both the years were well-trained in the field practicals. Poultry is the special feature of the school. Mr. Surve continued to be the Head Master. On account of the financial stringency, Mr. Ghumare, the Vernacular Assistant of the school was retrenched from the 1st November 1933. Mr. Salunke continues to do useful work and is a great asset to the school. As a substitute to the Vernacular Assistant, one of the best past students has been entertained as a Kamgar to help the Head Master specially in the Farm management and the field practicals. During the year under report, 40 applications were received for fresh admissions and 16 students have been selected for the 1st year class of the next year. The Boarding management, however, was not satisfactory, but it was put right by me by framing suitable rules and modifying the existing ones in regard to the internal management. The total expenditure and receipts of the school were Rs. 7,545 and Rs. 1,500 respectively. Thus the expenditure per boy per month comes to Rs. 28.

Both these schools were visited by me twice during the year. The Terminal and Annual Examinations of these schools were conducted by me with the assistance of District Agricultural Overseers and Farm Superintendents. Necessary advice and suggestions were made to the

Head Masters in order to make the schools more popular. The results of the Annual Examinations of these two schools are as under :—

Name of the school.	No. of the boys appeared.		No. of the boys passed.		Remarks.
	I Year	II Year.	I Year.	II Year.	
Devihosur ..	14	12	13*	8	*The boy who was plucked in the I Year is promoted to the II Year on re-examination in 1934.
Dhulia ..	10	12	10	12	

Past Students.—Past students of the Vernacular Agricultural Schools are spread all over the Presidency. There are in all 1,033 students turned out so far by all the Vernacular Agricultural Schools together. These men are the trained cultivators and the majority of them work on their own farms. They naturally form the best agency to spread agricultural improvements in villages. In order to facilitate this further, the system of maintaining history sheets of the past students has been introduced and this work is being attended to by the District Agricultural Overseers. But I regret to state that the work in this direction has not been quite successful. Divisional Deputy Directors of Agriculture have been recently requested to ask their district staff to give their careful attention to the work of the history sheets of the past students. During the year under report, 125 history sheets duly filled in were received for the presidency proper. Of these 59 were of the past students of the Devihosur School, 30 of the Dhulia School, 22 of the Loni School and 14 of the Godhra and Surat Schools together.

It is obviously necessary to form Central Associations of the past students of the Vernacular Agricultural Schools and for this purpose a set of by-laws were framed during the year under report for the guidance of the Head Masters of Devihosur and Dhulia Schools. The aims and objects of this association are :—

(1) To bring together the past students of the Vernacular Agricultural Schools at Devihosur and Dhulia for co-operation and mutual help.

(2) To make representations to higher authorities in regard to their common needs or difficulties.

(3) To improve the agriculture of the agriculturists of the Karnatak and Maharastra in general.

(4) To promote social intercourse among the members of the Association.

(5) To take steps for the advancement of the professional knowledge of its members.

I also tried to see as many past students as possible during my touring, and was able to meet about 50 students of different Vernacular Agricultural Schools. Such friendly talks often give them a considerable amount of encouragement and guidance in their work.

Agricultural Bias Classes.—Agricultural Bias Classes come under Primary Education under the control of the District Local Boards. The present type of primary education is not related to life and is too urban in outlook. Hence the need of giving some agricultural bias to the course of studies in primary schools was felt long since and as a step in that direction, the so-called agricultural bias classes were started more than a decade back. These classes were in an experimental stage for some years; but now they have passed that stage. They have come to stay. Although these classes are getting more and more popular every year on the whole, they have still a lot of leeway to make up. A certain amount of 'inferiority complex' is still attached to these classes as against the ordinary literary courses. Prejudices die hard. It is still necessary, therefore, to do a good deal of propaganda work in order to make the villagers realise the importance and usefulness of these classes. So, I have to do something in this line every year in course of my touring. During the year under report, I met almost all Presidents of District Local Boards, Chairmen of the District School Boards and many other local leaders of different villages, and brought to their notice the necessity and importance of Agricultural Bias Classes. During this year three more Agricultural Bias Classes have been opened—two in the Ratnagiri District and one in the Bijapur District and it is expected that 3 more Agricultural Bias Classes are going to be shortly started in the Bijapur District.

In all there are 92 Agricultural Bias Classes in the Presidency proper. Out of them 79 are managed by the District Local Boards and the remaining are managed by different mission societies and other private bodies. Out of the 79 Agricultural Bias Classes, managed by the District Local Boards, 26 are in the Southern Division, 29 in the Central Division, 12 in the Bombay Division and 12 in the Northern Division. In Karnatak, the Agricultural Bias Classes have become very popular in the Belgaum and Bijapur Districts. In Maharastra, the demand for these classes is greater in Nasik, Ahmednagar, Sholapur and East Khandesh than in other districts. In Konkan, these classes have recently become very popular in the Ratnagiri District. In Gujarat, these classes have become popular in the Kaira and Broach Districts.

During the year under report, I visited all the Agricultural Bias Classes once. In the course of my inspection, not only the teaching was observed but model lessons were also given on different subjects in almost all schools. The doubts and difficulties of the teachers were explained. Necessary instructions were given for further improvement. It is gratifying to note that a large number of these schools were found to be working according to my suggestions and instructions and had adopted revised time-table. All the schools were seen to be

doing good work. In many districts Agricultural Bias Classes are entrusted to one Supervisor only in order to maintain uniformity and efficiency.

STATEMENT A.

STATEMENT SHOWING THE DETAILS OF THE PAST AND PRESENT STUDENTS OF THE AGRICULTURAL BIAS CLASSES.

Serial No.	Name of District.	Number of A.B. Classes.	Number of the boys passed the V. F. Examination up till now.	Number of the boys appeared the V. F. Examination during the year.	Number of the boys passed V. F. Examination with Agricultural course during the year.	Number of boys employed in Government service.	Number of boys employed in Agriculture.	Number of the Rural clubs of the Past Students.	Number of the boys under instructions during the year under report.			Total.	Remarks.
									Standard V.	Standard VI.	Standard VII.		
1	2	3	4	5	6	7	8	9	10				
1	Nasik ..	7	86	52	20	39	28	5	114	85	64	263	
2	Ratnagiri ..	4	27	10	5	..	3	1	29	12	11	52	
3	Thana ..	1	23	10	7	1	10	1	15	8	9	32	
4	Surat ..	2	84	28	7	8	64	..	28	25	28	81	
5	Poona ..	3	93	25	15	24	47	3	50	44	43	137	
6	Dharwar ..	5	75	23	15	6	180*	4	50	35	54	139	
7	Kaira ..	2	87	21	11	11	40	2	32	17	32	81	
8	Sholapur ..	7	92	28	24	4	178	3	83	38	44	165	
9	Belgaum ..	13	205	127	75	5	204*	11	167	117	108	392	
10	Satara ..	4	256	70	51	36	130	4	84	67	82	233	
11	Bijapur ..	6	97	24	18	8	100	4	49	36	39	124	
12	Karwar ..	2	29	14	5	3	14	1	12	12	15	39	
13	Ahmednagar ..	7	175	57	35	25	56	4	83	63	85	231	
14	East Khandesh	6	247	85	45	19	165	5	136	106	99	341	
15	West Khandesh	2	35	10	5	11	30	1	44	37	23	104	
16	Broach ..	2	37	16	14	2	113*	2	39	17	27	83	
17	Panchmahals ..	4	98	23	14	..	153*	1	43	33	38	114	
18	Ahmedabad ..	2	24	6	6	4	8	1	16	25	43	84	
	Total ..	79	1,770	629	372	206	1,523	53	1,074	777	844	2,695	

*Some plucked students are included.

From this it is clear that 1,770 boys have passed their Vernacular Final Examination with the Agricultural Course. Many of the successful candidates and almost all the failed students are working on their own farms.

Steps taken to improve the Efficiency of the Agricultural Bias Classes and to maintain Uniformity throughout.

(1) *Note on Observation.*—In order to put an end to the prevalent vagueness in making observation which is an important item of the Agricultural Bias Classes, a note on observation was prepared and sent to all Agricultural Bias Classes. Detailed information as to what and how observation should be made by pupils of different standards was thus supplied to the teachers. The difficulties and doubts on this subject have thus practically disappeared. In many of the schools observation was made just according to my instructions and crops were raised most systematically both on individual and common plots with definite purpose in each case.

(2) *Standard Time-table.*—Up till now there was no standard time-table even in the same district for the Agricultural Bias Classes. The periods allotted to teach agriculture and its allied subjects varied from districts to district. In order to maintain uniformity, a standard time-table was prepared, according to the instructions of the Director of Public Instruction. Copies of the same were supplied to all Agricultural Bias Classes. The number of periods for different subjects is assigned in accordance with the importance of the subject concerned. Sufficient periods are reserved for the field practical and by-industries. Definite Instructions have been issued in the accompaniment to the standard time-table in regard to the division of work between the agricultural and non-agricultural teachers. I am glad to state that the revised standard time-table was given effect to during the second term of the year under report in almost all the schools.

(3) *Agricultural Statistics.*—In the matter of teaching agricultural geography by a comparative method, the agricultural teachers were handicapped everywhere for want of a suitable book on agricultural Geography in any vernacular. Hence agricultural statistics both of the Bombay Presidency and of India have been supplied to all Agricultural Bias Classes to enable the teachers to prepare useful and uniform maps and charts of them. Necessary instructions have been given as to how to prepare maps and charts and the model ones prepared by me were also shown at the time of my visits. It is hoped that the teachers will devote their energies to the preparation of these maps and charts which are of considerable educational importance.

(4) *List of Experiments.*—By careful observation I came to know that agricultural teachers lacked information as to how to teach the technical subjects by means of experiments. Hence a list of experiments is prepared with the necessary instructions to teachers. It is almost ready now and will soon be submitted to the Director of Agriculture for necessary action.

(5) *Text Books.*—There is a great paucity of text books for the Agricultural Bias Classes. In Maharastra some books have been written for the use of the Agricultural Bias Classes. But in Karnatak and Gujarat there were no books suitable for the Agricultural Bias Classes.

I have produced four books on agriculture in Kanarese, which are approved as text books for the Agricultural Bias Classes by the Director of Public Instruction. These books are also used as text books at the Vernacular Agricultural School, Devihosur. However, the position in regard to text books for the Agricultural Bias Classes is by no means satisfactory, and it is hoped that the Educational Department would give attention to this matter as early as possible.

(6) *Rural Clubs.*—Rural Clubs are the associations of past students of the Agricultural Bias Classes. There were 43 such clubs last year. During the year under report ten more rural clubs have been added to the list of the previous year. These clubs have been brought into existence with the object of guiding the past students of the Agricultural Bias Classes in the matter of introducing agricultural improvements in their own villages. In some places they are doing excellent work by inducing the cultivators to introduce the agricultural improvements such as new strains of seeds, artificial manures, improved implements and some remedies to combat the insect and plant diseases. So, the past students have not only become popular among the cultivators but they are also brought into closer contact with the agricultural teachers to know the up-to-date agricultural improvements.

(7) *Conferences.*—In Maharastra and Karnatak, I was able to attend many of the conferences of the Agricultural Teachers. In most of these conferences, both present and past pupils, parents and other teachers were also present. Some lessons on agriculture and its allied subjects were given by the agricultural teachers. I had to address three kinds of audience, viz., teachers, pupils and parents. As village people were interested in agriculture, general improvements made in agriculture were also brought to their notice. In this way some zeal about the Agricultural Bias Classes was created among the agriculturists and it can be definitely said that such conferences, exhibitions and demonstrations seem to be quite essential in every district to convince the public the best use of the Agricultural Bias Classes, to encourage good workers and to set up a healthy competition among the pupils for efficiency.

V. C. PAVATE,
Inspector of Agricultural Schools,
Bombay Presidency, Manjri Farm.

Synopsis of the Books published by the Inspector of Agricultural Schools, Bombay Presidency, Manjri Farm.

In order to satisfy the long felt need of suitable text books on agriculture, I published in Kanarese a text book on agriculture in four parts.

The 1st part deals with soil, manure, water and water-lifts. The second part contains easy lessons on cattle, their breeding, feeding and management. The third part gives a systematic account of the cultivation of staple crops in the Bombay Presidency ; and the fourth one deals with all kinds of plant and insect diseases with both preventive and curative remedies.

All these four books are sanctioned as text books on agriculture in the Agricultural Bias Classes of Karnatak and in the Vernacular Agricultural School at Devihosur by the Director of Public Instruction, Poona.

V. C. PAVATE,

Manjri Farm :
25th July 1934.

Inspector of Agricultural Schools,
Bombay Presidency, Manjri Farm.

Programme of Work under the Inspector of Agricultural Schools, Bombay Presidency, Manjri Farm, for the year 1934-35.

(1) Inspection of the Agricultural Bias Classes of the Presidency proper.

(2) Inspection and examination of the Vernacular Agricultural Schools.

(3) Watching the progress of the Vernacular Agricultural Schools in regard to the revised syllabus already introduced and making the Vernacular Agricultural Schools as popular and economic as possible.

(4) Starting the Central Associations of the Past Students of the Vernacular Agricultural Schools in order to help the Past Students and to spread Agricultural improvements through them in their villages.

(5) To push forward the movement of spreading Rural Clubs in the remaining Agricultural Bias Classes and watching the progress of such clubs already started.

(6) To offer advice to the Local Authorities and the officers of the Educational Department in the matter of starting more Agricultural Bias Classes.

(7) To watch how the syllabus, circular on by-industries, note on observation and standard time-table are being followed in the Agricultural Bias Classes.

(8) To supply the list of Experiments to all Agricultural Bias Classes in different vernaculars.

(9) To get maps and charts prepared in all Agricultural Bias Classes from the statistics already supplied.

(10) To organise some training classes in the vacations for the teachers and supervisors together.

(11) To bring out the work on Agricultural Arithmetic and that on Agricultural Geography.

V. C. PAVATE,

Inspector of Agricultural Schools,
Bombay Presidency, Manjri Farm.

APPENDIX P.

Summary of the Work done under the Professor of Agricultural Economics for the year 1933-34.

I. Administration.

1. I continued to work as Professor of Agricultural Economics throughout the year. In addition to my regular teaching and research duties, I also worked as one of the two secretaries of the Bombay Fruit and Vegetable Market Committee appointed by Government as per Government Resolution, Revenue Department, No. 8784/24, dated 28th June 1933, to investigate the existing methods of marketing of fruit and vegetables in the Town of Bombay and suggest measures for improvement. The draft report of the Committee is now ready and will be submited to Government in a few days. I had to spend a considerable part of my time on this additional work. I also attended and took an active part in the Fruit and Fish Trade and Fruit Export Trade Conferences convened by the Government of Bombay in July 1933.

2. During the year 1933-34, I was on tour for 66 days.

3. Mr. M. B. Ghatge, B.Ag., who was transferred under me from 13th June 1933 worked as Demonstrator in Agricultural Economics and Mr. K. M. Shah, B.Ag., performed duties as Investigator in Agricultural Economics from 17th May 1933, with his headquarters at Samarkha, near Anand, Kaira District.

II. Teaching.

4. During the year under report, 7 students had selected advanced agricultural economics as their optional subject in their final year. 9 advanced agricultural economics students including 2 old students appeared for the B.Ag. degree examination and 8 came out successful. Out of these 8 successful candidates, one stood first and another stood fourth among all the candidates who obtained their B.Ag. degree.

5. The compulsory course in agricultural economics goes under the group " General Agriculture " and the result in agricultural economics cannot, therefore, be given separately.

III. Research.

6. As reported last year, the research centre of my section is now situated in the *Charotar* tract of the Kaira District to study the economics of mixed farming with livestock raising. Three villages, Samarkha and Kasor in the Anand Taluka and Nisaraya in the Borsad Taluka have been selected. In selecting the villages and the farmers for study, the district, taluka and village revenue records have been fully made use of with a view to arrive at the most typical and

representative samples. The distribution of farms selected for study is as under :—

Name of Village.	No. of Farms.
Samarkha	10 Farms.
Kasor	10 ,,
Nisaraya	11 ,,
Total ..	31 Farms.

7. Complete data on the economics of these 31 farms are now available and though the work of a detailed and completely accurate analysis will take some more time, an attempt is made here to indicate provisionally the results obtained during the course of the year.

8. *Areas and Holdings.*—In selecting the farms, care was also taken to choose farmers by social groups. Thus out of the 31 selected farmers 20 were *Patidars,* an enterprising and progressive class, and the remaining 11 were *non-Patidars,* consisting of *Dharalas, Rajputs, Barot, Patanwadia* and *Dhed.* The total area cultivated by these 31 farmers was 189 acres and 30 gunthas distributed as follows :—

	All Farmers.		*Patidar* Farmers.		Non-*Patidar* Farmers.	
	31 farms.	Per farm.	20 farms.	Per farm.	11 farms.	Per farm.
	A. g.	A. g.	A. g.	A. g.	A. g.	A. g.
Owned land ..	114 18	3 28	96 7	4 32	18 11	1 26
Leased land ..	69 10	2 9	31 24	1 23	37 26	3 17
Land cultivated in partnership.	6 2	0 8	6 2	0 12	....	....
Total ..	189 30	6 5	133 33	6 27	55 37	5 8

The distribution of farms according to the size of holdings was as follows :—

Class Interval.	Frequency (No. of farmers).
Below 2 acres	2
Between 2 to 4 acres	6
Between 4 to 6 acres	11
Between 6 to 8 acres	7
Between 8 to 10 acres	2
Between 10 to 12 acres	0
Between 12 to 14 acres	1
Between 14 to 16 acres	1
Between 16 to 18 acres	0
Between 18 to 20 acres	1

The average number of fragments per holding of a *patidar* farmer was 4, while an average holding belonging to *a non-patidar* was fragmented into 5 pieces.

Out of 189¾ acres covered by the 31 farms, only 91 per cent. of the area was cropped, while the remaining 9 per cent. was put under grass for

feeding the farm bullocks and milch cattle. Of the net cropped area 10·4 per cent. of the land was cropped more than once. It was observed that double-cropping was more commonly practised in lands taken on lease.

9. *Capital.*—The analysis of the capital position of the 31 farmers at the beginning of the year indicates the following distribution of capital *per farm* :—

	Rs.	
Fixed Capital—		
Land and its fixtures ..	2,542	68·35 per cent.
House and cattle-shed ..	1,177	31·65 ,,
Total ..	3,719	100·00
Operating Capital—		
Livestock ..	160	39·31 per cent.
Implements and tools ..	47	11·55 ,,
Materials on hand ..	123	30·23 ,,
Cash on hand ..	17	4·17 ,,
Amount due from others ..	60	14·74 ,,
Total ..	407	100·00

The total capital per farmer, therefore, came to Rs. 4,126 while the average debt per farmer at the beginning of the year was Rs. 895.

10. *Labour.*—The system of exchanging labour, or *Sundal* in *Gujarati* is very highly developed in this tract and farmers freely co-operate with each other in getting the farm work done by exchanging human and bullock labour. The percentages of home labour, exchange labour and hired labour utilised on the farms under study were as follows :—

	Home labour.	Exchange labour.	Hired labour.	Labour obtained gratis.	Total.
Somarkha Farms—					
Man labour	45·60	15·45	38·95	....	100·00
Woman labour	60·55	0·74	38·71	....	100·00
Bullock labour	38·69	45·03	9·64	6·64	100·00
Kasor Farms—					
Man labour	59·36	12·07	28·57	....	100·00
Woman labour	84·55	....	15·45	....	100·00
Bullock labour	38·36	38·83	17·76	5·05	100·00
Nisaraya Farms—					
Man labour	54·41	15·33	30·26	....	100·00
Woman labour	82·40	6·55	11·05	....	100·00
Bullock labour	59·10	32·29	7·52	1·09	100·00
All Farms—					
Man labour	52·75	14·52	32·73	....	100·00
Woman labour	78·68	3·62	17·70	....	100·00
Bullock labour	47·40	37·90	10·90	3·80	100·00

Man labour is thus more freely exchanged than woman labour. But women in this tract decidedly work harder and probably for longer hours than their sisters in many other parts of the Presidency. Dairying is one of the most important subsidiary source of income to farmers in this tract and the care and management of milch animals are almost always left to the women in the family. This work plus the usual household duties keep the women thoroughly busy practically throughout the year. In spite of the hard work at home, however, the women go on their farms for work and our results indicate that about 77 per cent. of the woman labour employed on the 31 farms was supplied by the female members in the farmers' families. The exchange system in the matter of bullock labour, however, is remarkable. The reason for this is that majority of farmers cannot afford to maintain a pair of bullocks. Of the 31 farmers under study, 9 or 29·3 per cent. do not possess any bullock, 21 farmers or 67·5 per cent. own only one bullock each, while the remaining one farmer, or 3·2 per cent., has two bullocks. Those who do not possess any bullock get their work done by engaging bullocks on hire or sometimes free by request. In spite of this highly developed system of co-operation, however, the utilisation for farm work of the available man and bullock labour force came to only 41 per cent. and 31 per cent. respectively.

Utilisation of the available Man and Bullock Labour Force of the 31 *Farms.*

	Total labour units available.	Labour units actually used for farm work.	Percentage of labour used for farm work.
Samarkha Farms—			
Man labour	5,376·0	2,074·25	38·58
Bullock labour	2,446·0	996·25	32·55
Kasor Farms—			
Man labour	4,608·0	1,937·75	42·05
Bullock labour	2,191·0	634·50	28·96
Nisaraya Farms—			
Man labour	7,296·0	3,090·75	42·36
Bullock labour	4,242·0	1,150·00	27·11
All Farms—			
Man labour	17,280·0	7,102·75	41·10
Bullock labour	8,879·0	2,780·75	31·34

11. *The Season and the Crops.*—The year 1933–34 was exceedingly abnormal in the tract both with regard to the quantity and distribution

of rainfall. The total rainfall at Anand and Borsad was 43·09 inches and 47·43 inches as against the normal of 34·09 inches and 33·62 inches respectively. After sowing, there was a long break which considerably affected the growth of cereals. Showers at the time of *Bajri* harvest affected the quality of the crop and the frost in the month of January destroyed, almost completely in some cases and particularly in others, the money crops of tobacco and *tur*.

35·01 per cent. of the area under observation was under Tobacco, while *Bajri*, *Kodra*, Paddy and *Vagardu* together claimed 43·42 per cent. *Sundhia Jowar* as a fodder crop occupied 18 per cent. of the total area.

12. *Incomes.*—The farm business incomes* per farm and per man day† of farm work were as follows :—

	Per Farm.		Per Man Day of Farm Work.	
	Patidars.	Non-Patidars.	Patidars.	Non-Patidars.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Samarkha Farms ..	149 2 0	4 4 11	0 11 0	0 0 5
Kasor Farms ..	61 13 6	14 11 3	0 5 6	0 0 9
Nisaraya Farms ..	181 3 10	67 11 0	0 10 6	0 3 10
All Farms ..	117 14 0	39 13 3	0 8 9	0 2 6

The lower cash incomes are very largely due to the fall in prices. In spite of the holdings being so small the *patidars* decidedly make better incomes due to their hard work and deligent cultivation.

The average number of persons per farmer comes to 5·2 and the farm business income obtained for the farm alone is found insufficient to feed and clothe the farmer's family in a standard considered essential by the people. Each farmer therefore tries to supplement his income by maintaining milch buffaloes and from other miscellaneous sources like rent of land given on lease to others, fruit trees, miscellaneous business of buying and selling, carting, earning wages by working for others, preparing *bidies*, etc. The principal source of subsidiary income and food is, however, the milch buffalo. Careful and efficient maintenance of cattle both for their draught and products is one of the important characteristics of this tract. Each farmer maintains only one or two

* Farm business income is taken to mean farm receipts *minus* out of pocket expenses. The out of pocket expenses include charges for hired labour, bullock labour cost, seed, manure, rent on leased land, depreciation on equipment and land assessment and local fund cess.

† Man day is taken to mean the amount of farm work put in by one man in one day. In calculating the returns per man day, hired labour is excluded as it was separately paid for, but exchange labour is included.

animals, but good and useful animals. The total number of buffaloes maintained by the 31 farmers under study was 43 which provided work, some cash income and food to the farmer's family members. The total business income per farmer from the farm, milch animals and other miscellaneous sources was as follows :—

Business Income per Farmer.

——	Farm.	Dairying.	Miscellaneous Sources.	Total Income.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Patidars ..	117 14 0	25 5 6	147 8 9	290 12 3
Non-Patidars ..	39 13 3	63 0 1	32 7 3	135 4 7
All Farms ..	90 2 11	38 11 4	106 11 3	235 9 6

The average total income obtained per farmer, therefore, comes to Rs. 235–9–6 which when distributed over 5·2 persons per family comes to about Rs. 45 per person per annum.

13. The results of analysis have so far been extremely interesting, illuminating and of practical utility. But it seems to me that the income measures adopted in this country and abroad are not quite suitable to depict the true economic position of our farmers who grow more for family consumption than for the market. The finding out of net profits, labour and business incomes involves considerable amount of estimating and the figures obtained may not show the actual state of affairs. The income measures in common use have certainly their own usefulness, but it appears that these must be supplemented, if not altogether replaced, by some other method of analysis that will clearly show the actual position of our farmers and farming.

14. The results of costing of 25 farms at and near Malsiras in the Sholapur District for three years are now complete and will soon be submitted for publication as a bulletin.

IV. Publications.

SHIRNAME, T. G. .. Marketing of Some Agricultural Products Exported from Bombay to the United Kingdom.

(Bulletin No. 173 of the Department of Agriculture, Bombay.)

SHAH, K. M. .. Grading of Agricultural Products in the Bombay Market.

(The Poona Agricultural College Magazine, Vol. XXV, Nos. 1 and 2, July and September 1933.)

SHAH, K. M. .. How Our Over-Seas Trade is being conducted.

(In *Gujarati*. The Gujarat Agricultural and Industrial Quarterly, July 1933.)

College of Agriculture :
Poona, July 19, 1934.

T. G. SHIRNAME,
Professor of Agricultural Economics.

Publications issued by the Professor of Agricultural Economics and his Staff during the year 1933-34.

SHIRNAME, T. G.—

Marketing of Some Agricultural Products Exported from Bombay to the United Kingdom.

(Bulletin No. 173 of the Department of Agriculture Bombay.)

An account of the recent trade tendencies of the more important products of Bombay and Indian agriculture is given with particular reference to foreign competition and trade complaints as evinced by personal enquiries made by the author in the United Kingdom markets. The advantages that are likely to be obtained due to the Ottawa Agreement for the different agricultural products exported to Britain have also been given. The disadvantages of exporting ungraded products have been fully discussed. On the useless material sent along with groundnuts alone, India spends something like Rs. 1,71,430 annually on freight charges.

SHAH, K. M.—

Grading of Agricultural Products in the Bombay Market.

(Poona Agricultural College Magazine, February 1933, July 1933 and September 1933 numbers.)

This was a special study undertaken in the Bombay market with regard to the grading of agricultural products, like groundnuts, linseed, castor seed and *til*, exported to foreign countries. The material was published in a series of articles in three issues of the College Magazine. The articles give the general methods of grading, the prices of different grades and quantities of useless and low-priced material that is usually exported along with sound produce paying for it unnecessarily the transport and the other marketing expenses.

SHAH, K. M.—

How Our Over-Seas Trade is being conducted.

(In *Gujarati*. The Gujarat Agricultural and Industrial Quarterly, July 1933.)

The article published in a vernacular journal describes for the information of general readers how the exporters of our agricultural products conduct their business.

College of Agriculture : T. G. SHIRNAME,
Poona, July 19, 1934. Professor of Agricultural Economics.

Programme of Work under the Professor of Agricultural Economics, Poona, for the year 1934-35.

(1) Completing the writing up work on the data collected at and near Malsiras and submitting it for publication as a bulletin.

(2) Continuation of the study of the economics of mixed farming with livestock raising in the *Charotar* tract of Gujarat.

(3) Preparing a scheme for a farm economics survey in the *Charotar* tract to study the possibility of survey method of research and to supplement the data that are being obtained by cost accounting method.

(4) Attempting a survey of the marketing of *gul* on the *Mutha* canal as time and resources permit.

(5) Teaching farm management and agricultural economics to students of the College.

College of Agriculture :
Poona, July 19, 1934.

T. G. SHIRNAME,
Professor of Agricultural Economics.

APPENDIX Q.

Summary of Work done under the Professor of Agricultural Engineering, Physics and Mathematics for the year 1933-34.

This is the first year of the report of this section. So far this section has been mainly a teaching section, as most of the time of its members has been devoted to teaching at the College. Land Development work used to be taken up during the vacations so far as time permitted.

1. During the year under report, arrangement is made to utilize the services of the head of this section on a wider scale for the district advisory work and a grant of Rs. 400 has been allotted to this section for taking up research study in details of the Soil Erosion problem in General, including the process of erosion on cultivated and non-cultivated lands under different conditions and the determination of suitable ways and means for its preservation.

The work was taken up by the end of the year. Observation plots are selected near the College and detailed records and levels are being maintained. One of the plots is opposite the Chaturshringi hill. This offers different features of an uncultivated plot with various gradients. Its area is about 30 acres. Some of the gulleys in the plot are very carefully surveyed and levels recorded and reference Bench mark stones are fixed up. The Katraj Valley about 8½ miles from Poona along the Poona-Mahableshwar Road presents special features for terracing and levelling. A few cultivated and other plots are kept under observation also. Special small plots are prepared on the observation lands to measure the general erosion. This is rather handicapped for want of necessary funds. With the experience gained it would be possible to put in detailed proposals next year.

Diva Ghat Forest area under the Economic Botanist is visited and observations will be recorded there.

With a view to decide the policy and outline of general work in the Districts a meeting of the Deputy Director, Central Division and his bunding assistant, the Deputy Director of Southern Division, the Chief Investigating Officer for Dry Farming Scheme and the Professor of Agricultural Engineering with his assistant was held at Poona on 4th May 1934. The general conclusions and outlines as decided are reported to the Director of Agriculture.

It is proposed to maintain a general register of important land development schemes of the Presidency proper and a beginning has already been made.

2. There are no observations to offer this year as the work has just been started.

3. There are no publications of this section.

4. *Programme of work for* 1934–35.—The work for the next year would mainly consist of the following :—

(1) Observations and study of the plots selected.

(2) Diva Ghat Forest area observations.

(3) Advisory work in the district.

(4) Visit to various schemes and places for observations.

(5) Central record of the works.

(6) Preparation of a working pamphlet for the land development schemes.

(7) The question of economic wells will be gone into.

J. P. TRIVEDI,
Professor of Agricultural Engineering,
Physics and Mathematics.

APPENDIX R.

Summary of Work done under the Professor of Entomology for the Year 1933-34.

During the year under report I remained in charge of the Entomological Section at the College as well as attended to Departmental and District inquiries relating to Pests.

Looking to the importance of this Section at the College as well as its utility and usefulness to the Public and Agriculturists, the Government made the Entomological Section independent like other Sections at the College and the designation of the Assistant Professor of Entomology has been changed to the Professor of Entomology from 1st April 1934.

The work of this Section falls into three main catagories :—

I. Teaching work at the College of Agriculture.

II. Investigation and Research work.

III. Propaganda and Advisory work.

I. Teaching.

There are two courses of Entomological teaching at the College. The first course is of Compulsory Entomology for the Junior Class students, while the second is of Advanced Entomology for the Optional final year Degree Students. The teaching of these courses was conducted successfully during two Sessions of the College with the help of one Assistant—Dr. V. G. Deshpande, Lecturer in Entomology. The University result of the former was 88 per cent. while that of the latter (Advanced Entomology) was cent per cent.

During the Second Session of the College, one Post Graduate Student joined under me for M.Ag. Thesis on problems of Economic Entomology.

II. Research Work.

Two main problems on researches of (1) Chillie Thrips and (2) Cabbage Aphis were tackled during the year.

(1) *Chillie Thrips* (*Scirtothrips dersalis*).—This problem is in hand since these last four years or so. Its life history, method of oviposition, incidence of the pest at different seasons of the year, and the carry over from one season to the other,—all these points were investigated. Its alternate hosts were also ascertained and for that purpose, Thrips collected on various host plants—including cultivated crops, weeds, fruits trees etc.—were sent to a specialist and ascertained that this Chillie Thrips has got nearly seventeen host plants of different types.

During the year under report the problem was narrowed down to investigate two points viz.—

(*i*) To raise Chillie plants under cages with and without Thrips.

(*ii*) To assess damage caused by Thrips.

As for the first, it has been found, that those chillie plants raised under cages in isolated conditions and free from Thrips had a very luxuriant growth of plants (nearly four feet in height and eight feet in circumference) and bumper yield of chillie pods ; while those plants raised under cages with Thrips introduced on them, and allowed to multiply had a very diminutive growth, and practically no yield of pods.

As for assessing the damage caused by Thrips alone, without any sort of contamination, the point is still under investigation, and for that purpose it is essential to breed out Thrips from eggs and introduce them on plants raised under Laboratory conditions.

(2) *Cabbage Aphis.*—(*a*) " Myzus persicae "—Mula Aphis.

(*b*) " Brevicoryne (Aphis) " brassicæ—Cabbage Aphis.

(*c*) Siphocoryne indobrassicæ—Mustard Aphis.

This problem is in hand since these last two years and it has been ascertained that the above three species of Aphis are found breeding on Cabbage and when all the three species of Aphis are present on the plant severe damage is caused to Cabbage crop.

The life history and habits of these Aphis have been worked out and it has been ascertained that they are all parthenogenetic viviparous females.

A young Aphis, after being laid by the mother, becomes full-grown in about 4 days and begins to produce living young ones. Thus in a period of about 30 to 40 days one wingless Aphis gives birth to about 100 Aphis, becomes winged, and flies from plant to plant, still producing living young ones for a further period of 8 to 15 days.

Several Contact poisons were tried, out of these—(1) Derrisol and (2) Nicotine Sulphate (Black leaf 40) gave cent per cent. kill of Aphis.

The Derrisol is a proprietory product prepared out of Derris roots. The cost of spraying an acre of Cabbage crop, came to about Rs. 5 while the Nicotine Sulphate cost approximately the same.

The Aphis usually make their appearance on young seedlings in seed-bed and from thence, they are transmitted to the field. So if one or two sprayings are given in the seed-bed, it goes a great way to check the Aphis and the cost of spraying in the seed-bed is quite negligible. The further investigation is in progress.

(3) *The other items of Importance.*—(1) *Cochineal Insect* (*Dactylopius tomentosus*).—The distribution of this insect was continued during the year, for control of Prickly pear bushes. It has spread in almost all the districts of Karnatic, and the Deccan except Khandesh, and wherever the insect was introduced, it was quite successful in destroying the Prickly-pear bushes.

It is a small sucking bug with a white mealy covering, which injects into the tissues of the pear, a sort of pathogenic fungus, called Phoma,

which ultimately completes the work of destruction of pear into a rotten fibrous mass so much so that there is no re-growth of the pear thereafter.

This Cochineal Insect has no other host plant excepting Prickly-pear, and the crawlers and winged males being very minute and light in weight, are easily disseminated by wind and other natural agencies to un-inoculated prickly-pear bushes in the locality.

Trials were made to ascertain whether this Cochineal Insect is amenable to Contact poison and it was found that the spraying of Fish oil Rosin soap ($\frac{1}{2}$lb. to 4 gallons water) as contact poison was quite successful in annihilating the colonies of this Insect.

(2) *Lac culture* (*Tachardia lacca*).—Trials were made during the year, to propagate Lac Insects on Ber (Ziziphus zuzuba) and Babul (Acacia sp.).

On Ber, the breeding was quite successful, while on Babul the lac insects did not thrive and ultimately dried up due to some unknown cause.

The predaceous caterpillars (Eublemma amabilis) were found feeding on Lac encrustations at some inoculated places.

(3) *Bee-keeping.*—Search and attempts were made at Poona and in other localities to get local strains of "Apis indica" to start apiculture during spring and swarming period of honey bees. But nowhere the local strains of "Apis indica" were found, excepting the strains of wild honey bee (Apis dorseta) and small Bee (Apis florea), which cannot be domesticated and utilised for artificial Bee keeping, as these last two species form single hives, and not compartmental wax combs like "Apis indica."

Further attempts will be made next year to get local strains of "Apis indica."

III. Propaganda and Advisory Work.

During the year under report the specimens of Insects, showing the life histories of field and orchard Pests, together with spraying and dusting machineries and insecticides were exhibited and demonstrated at the occasions of 5 Agricultural Shows and Exhibitions; besides that eight meetings and Classes were attended to explain and discuss the life histories of different pests and Insects.

During the year more than 25 places in the Presidency were visited for investigation and demonstration of Central measures of various pests.

Advisory work relating to various field and orchard pests were attended to throughout the year and nearly more than 100 such inquiries were gone through, pests identified and adequate advice and help were given in the matter.

The Insect Museum arranged in the Entomological Laboratory at the College of Agriculture, Poona, was visited by public, Agriculturists, and students of various institutions and about 250 individuals visited and took advantage of this Museum during the year.

In closing the report, I would like to point out that this Section is in great need of an extra Assistant for District Work. In absence of that, as well as for want of a clerical staff, the Section worked under heavy strain during the year.

T. N. JHAVERI,

Poona, 12th August 1934. Professor of Entomology.

Programme of Work under the Professor of Entomology for 1934-35.

1. *Chillie Thrips.*—To rear out Thrips from eggs without any contamination, and to liberate them on Thrip free plants, for assessing damage caused by Thrips.

2. *Cabbage Aphis.*—To investigate the incidence of all the three species, of Aphis on cabbage and to determine the damage to the crop.

To find out the co-relation of the meteorological factors with the fluctuations of Aphis population and to evolve a contact insecticide from the locally available materials and to determine its efficacy in control of Aphis with the proprietory products.

3. *Investigation of Lang Pod-borers at Vagra, District Broach.*—Survey and determining the species responsible for the damage. To work out the life history, habits, alternate hosts and carry over of the pest.

4. *Citrus Scale.*—To determine the control of brown Citrus scales by spraying with Contact poison.

5. *Advisory and Propaganda work.*—Inquiries relating to control of pests will be attended to as usual and necessary advice and help will be rendered.

T. N. JHAVERI,

Poona, 12th August 1934. Professor of Entomology.

List of Agricultural Bulletins published by the Department of Agriculture and kept for Sale at the Government Book Depot, Bombay.

No.	Year.	*Subject.*	Price. Rs.	a.	p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa.	0	8	0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.	0	4	0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona ...	0	4	0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist ...	0	14	0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta	0	4	0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona	0	5	0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon .	0	12	0
41	1911	Groundnuts in the Bombay Deccan	0	4	0
43	1911	An Examination of the Seed-Supply of the Broach District, Part II	0	5	0
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency	0	8	0
45	1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency	0	14	0
46	1911	Seed Selections Series I, Broach Cotton	0	8	0
47	1911	San Hemp	0	4	0
48	1911	Poona Furnace	0	7	0
„	1911	Do. (Marathi)	0	6	0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I	0	5	0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0	3	0
51	1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew	0	3	0
52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India	0	8	0
53	1912	A Method of improving the Quality of Cotton Seed	0	7	0
55	1913	An Examination of the Seed-Supply of the Poona District ...	0	3	0
57	1913	Improvement of the Indigenous Plough of Western India ...	0	12	0
59	1914	Common Salt and its use as Manure in the Konkan Division ...	0	3	0
62	1914	The Value of Castration of Deccan Bullocks	0	3	0
63	1914	Substitutes for Rab	0	3	0
64	1914	Alkali or Kalar Experiments and Completion Report of Daulatpur Reclamation Station in Sind	0	14	0
67	1914	An Examination of the Seed-Supply of the Sholapur District ...	0	3	0
69	1915	The Rice Stem Borer in the Konkan	0	3	6
70	1915	Improvement of Cotton in the Bombay Presidency (except Sind).	0	3	6
74	1915	Well Waters from the Trap Area of Western India	0	6	0
79	1916	The Cultivation of Guavas in Gujarat	0	5	6
80	1916	List of Seeds available on the Agricultural College Farm, Poona .	0	5	3

No.	Year.	*Subject.*	Price. Rs. a. p.
81	1916	Note on Fencing Construction	0 6 9
82	1916	Cultivation of drilled Paddy in South Bombay Presidency ...	0 8 0
83	1917	The Spice Gardens of Sirsi in Kanara	0 10 6
84	1917	Seed Selection Series—Kumpta Cotton	0 1 0
85	1917	Note on Cattle in the Bombay Presidency	0 11 0
86	1917	Establishment and Management of the Dairy Farm ...	0 7 0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm	0 9 0
88	1918	First Report on Fruit Culture as practised round about Tharushah (Sind) in Nawabshah District	0 2 0
90	1918	Work on the Manjri Farms for the years 1915-18	0 7 3
91	1919	The Cultivation of Berseem in Sind—Experiments at Sukkur ...	0 1 0
92	1919	Classification and Description of the Jowars of the Bombay-Karnatak	0 10 3
93	1919	Palm Gul Manufacture in the Bombay Presidency (principally Date Palm)	1 3 9
94	1919	The Sugarcane Borer and its Control	0 4 3
96	1920	Investigations into the nature of the Salt Lands of Sind ...	0 12 0
97	1920	Prickly-Pear as a Cattle Food	1 4 0
98	1920	Fruit Culture as practised near Shikarpur, Sind	0 1 6
99	1920	Rice Cultivation in the Larkana District, Sind	0 8 0
100	1920	Fodder Crops of Western India	2 1 0
101	1920	Fruit Culture in Palitana and Jamnagar	0 8 6
102	1920	Investigations on Potato Cultivation in Western India ...	1 15 0
103	1920	The Book of the Mango	3 5 0
		Do. do. (Marathi).	
104	1920	The Ganeshkhind Botanical Garden, Kirkee (Its Genesis and Development)	0 15 6
105	1920	The Groundnut Bug and its Control	0 2 0
106	1920	Dharwar American Cotton: Its History, Cultivation and Improvement	0 7 0
107	1921	Gonag—a Weed in Drilled Paddy	0 5 0
108	1921	Summary of the work done on Jalgaon Farm	0 5 6
		Do. do. (Marathi)	
110	1922	Year Book of the Agricultural Department in the Southern Division	0 5 0
111	1923	A Note on Well Boring	0 8 0
113	1923	Year Book of the Agricultural Department in Sind Division ...	0 8 6
114	1923	Studies on the Rice Plant and on Rice Cultivation	0 13 0
115	1924	Shevri as a Fodder Crop	0 3 0
116	1924	Sugar Industry in Western India and Methods of Sugar Manufacture	1 2 0
117	1924	Investigations in Fig Culture and Treatment	0 5 6
118	1924	Land Crabs as Agricultural Pests in Western India	0 8 0
119	1924	Year Book of the Agricultural Department in Southern Division, 1924	0 4 6
120	1924	Silage for Fodder in Western India	0 4 0
121	1924	Further Investigation on Potato	0 6 0
72	(Revised 1925)	Experiments with the Automatic Water Finder in the Trap Region of Western India	0 4 0
122	1925	Sugarcane Varieties of Bombay Presidency, India	0 2 6
123	1925	Ridge Cultivation in Lower Gujarat	0 8 0

No.	Year.	*Subject.*	Price. Rs. a. p.
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125	1925	Some of the promising exotic Sugarcane varieties of the Manjri Farm	0 13 0
126	1925	The Bhagnari Breed of Cattle in Sind and Baluchistan ...	0 6 0
127	1926	Elephant Grass—a new and useful Fodder Crop in Western India	0 1 0
128	1926	Cotton Cultivation in Sind	0 3 0
129	1926	The treatment of patches of Inferior Tobacco in Northern Gujarat	0 1 6
130	1926	Some useful forest Trees and Shrubs of the Coastal Tract and their fodder value	0 8 0
131	1926	The Fig Industry of Asia Minor	0 4 6
132	1926	The Improvement of Tobacco in Northern Gujarat	0 4 0
133	1926	Work of the Ganeshkhind Botanical Gardens and Modibag Garden in 1921-25	0 2 0
134	1927	Murrah Buffaloes in Sind	0 2 6
135	1927	An improved method of growing Turmeric in the Deccan ...	0 4 0
136	1927	Cattle Breeding in the Bombay Presidency, Principles and Progress	0 5 6
137	1927	Notes on the Lemon Industry in Italy	0 2 0
138	1927	Injurious Field Rats of Lower Sind and their Extermination ...	0 7 6
139	1927	Sugarcane Mills and small power Crushers in the Bombay Presidency	0 6 6
140	1927	Tobacco Cultivation in the Southern Maratha Country ...	0 3 0
141	1927	Trees and Shrubs for producing Green Manure in the Konkan and North Kanara	0 3 0
142	1927	Dry Farming Methods in the Deccan	0 6 9
143	1927	Experiments on Cotton Manuring in Khandesh	0 1 3
144	1927	Furnaces for making Gul or Crude Sugar in the Bombay Presidency	0 7 3
95	(Revised 1927)	The Cultivation of Oranges and allied Fruits in the Bombay Presidency	0 3 0
146	1927	Crops of the Bombay Presidency: their Geography and Statistics, Part II	1 11 0
147	1927	Organisation and Cost of Gul-making in the Deccan Sugarcane tracts	0 2 6
150	1927	Crops of Sind: their Geography and Statistics	2 1 0
151	1928	Selections in the Jowars of the Bombay Presidency	0 6 0
152	1928	Water-finder Work in the Bombay Presidency	0 8 0
153	1928	Economic Value of Fruit Farming in Western India ...	0 6 0
154	1928	Assimilation of Nutrients by the Rice Plant (Technical series) ...	0 5 0
155	1928	Die-back disease of Citrus trees and its relation to the soils of Western India	0 5 0
30	(Revised 1928)	Field, Garden and Orchard Crops of the Bombay Presidency	0 7 0
156	1928	Grape Culture in Western India	0 7 0
157	1929	Study of the Soils associated with the deterioration of the Cardamom Crop in North Kanara	0 3 0
158	1929	Preliminary Note on the possibilities of the development of Lemon Industry in Western India	0 2 0
159	1929	Agriculture in Sind under the Barrage Canals system ...	0 6 0

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163	1930	Powdery Mildew of the Grape and its Control in Bombay ...	0	3	0
164	1930	Study in Intensive Farming near Poona under Canal Irrigation .	0	4	0
165	1930	The Frost of January 1929 and its damage to Crops of the Bombay Presidency	0	6	0
166	1931	Bansi Wheat of the Bombay Deccan and its Improvement ...	0	2	0
167	1931	Improvement of Manat lands in the North Konkan	0	2	0
168	1932	Preliminary Studies of important Crops in the Bombay Deccan in the postwar period	0	10	0
169	1932	Cumin powdery Mildew in Bombay	0	3	0
170	1932	Report on the Export of Mango to Europe in 1932	0	9	0
171	1932	Grassland Problems in Western India	0	3	0
172	1933	Summaries of the Annual Reports of the experimental work done under the Economic Botanist to Government from 1893 to 1916	0	2	0
173	1933	Marketing of some agricultural products from Bombay to the United Kingdom	0	3	0
174	1933	Composition of important manures and manurial constituents of important crops in Western India	0	2	0
		Publication on "Experiments in manuring crops in the Bombay Presidency from 1896 to 1931"	2	9	0
175	1934	Manufacture of white sugar and gul by the open-pan process ...	0	3	0